JANUARY 12, 1953

Electrical World

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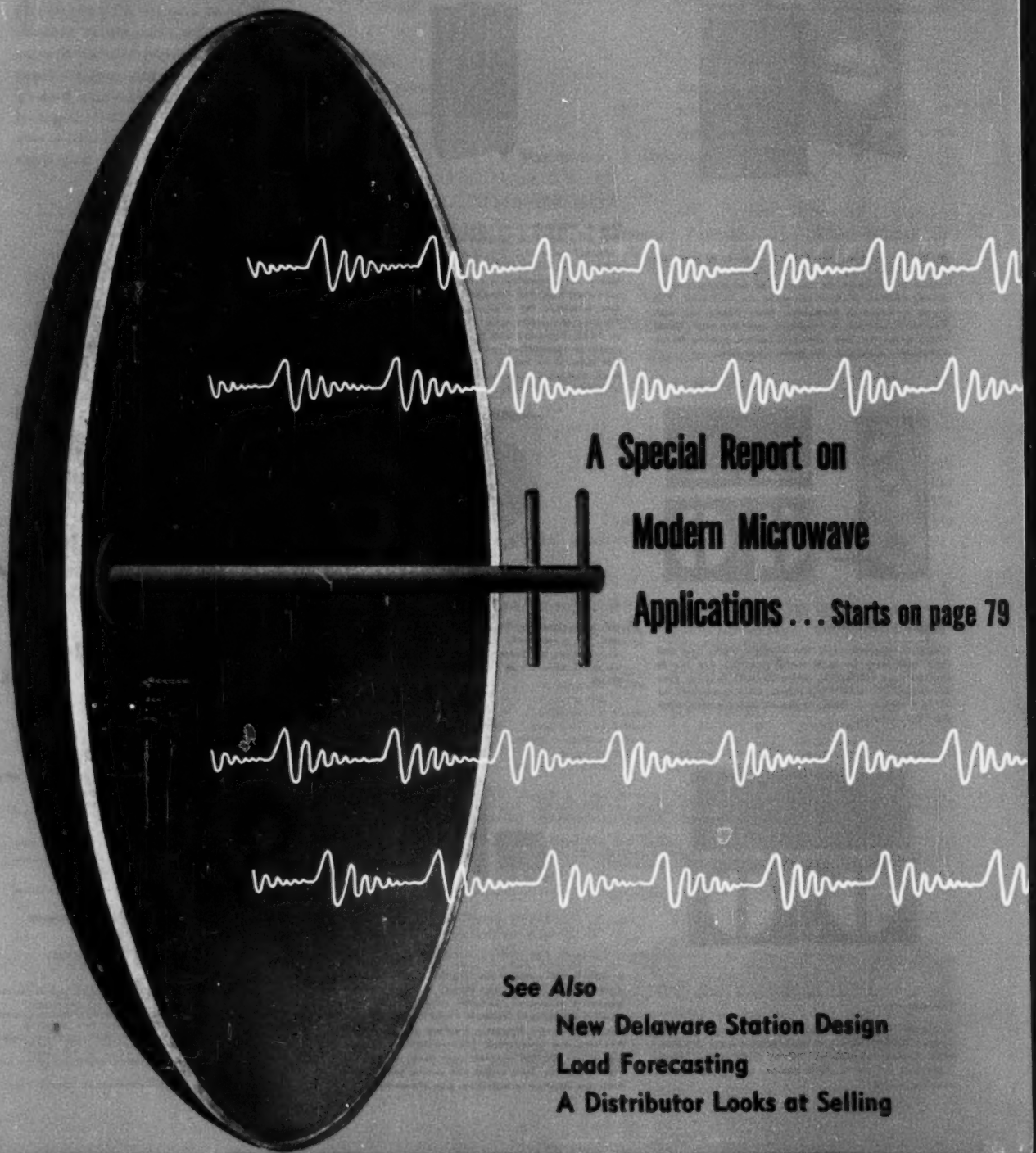
A McGRAW-HILL PUBLICATION



A Special Report on Modern Microwave Applications

. . . Starts on page 79

See Also

New Delaware Station Design

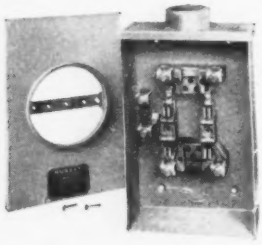
Load Forecasting

A Distributor Looks at Selling

SIMPLIFY your meter mounting problems....choose from the COMPLETE Murray line

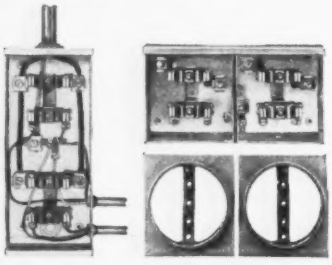
OUTDOOR METER SOCKET

Single or multiple units (saves nippling in the field). Provisions for fifth and sixth jaws. Reversible jaws for vertical or horizontal mounting. Two or three hubs—1" or 1¼". Pressure connectors. Finished in grey baked-on Melamine (a really rugged finish).



OUTDOOR WEATHERPROOF—RAINTIGHT METER SOCKETS

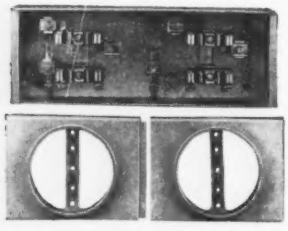
A medium duty socket. Contact surfaces of jaws are silver plated. Single phase installation can be converted to polyphase by substituting polyphase blocks. Sturdy cabinet, built of corrosion resistant steel. The finish is baked-on Melamine. Deep lipped top with hub for 2" conduit, is welded to sides and back. Cover slides under top, over sides and bottom, making device completely raintight. An economical unit.



OUTDOOR SOCKET METER TROUGHS

(Vertical or Horizontal)—

Single or multiple units. On multiple units, line and load terminals at each meter position are lay-in pressure type connectors, which simplify bussing. Line connectors for #4 to #3/0 cables. Load connectors for #4 to #1/0 cables. Made in sizes to accommodate from one to six meters.



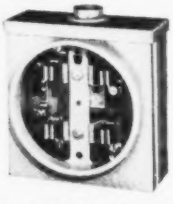
INDOOR SOCKET METER TROUGH

(Horizontal)—

Available in one to three meter positions. Can be ganged readily. Line and load terminals are pressure type. Line connectors for #4 to #3/0 cables, load connectors for #4 to #1/0 cables. Lay-in connectors simplify wiring.

TYPE H.D. HEAVY DUTY METER MOUNTING DEVICE

Has a maximum continuous carrying capacity up to 200 Amperes. Can be used with any standard 4 or 5 terminal meter on 1, 2 or 3 phase, 3 wire installations. Where the standard 50 Ampere meter is used, the heavy duty mounting is suitable for 200 Amperes intermittent duty and 150 Amperes continuous duty. Vise-jaw terminals for high-strength, high conductivity. Pressure connectors take line conductor sizes from #6 to #4/0. Equipped with transparent acetate shield for safety in installation and testing. By-pass clamps permit removal or testing of meter without interrupting load. Corrosion resistant, weatherproof case. Supplied with 2" or 2½" hubs.



MODIFIED OUTDOOR SOCKET METER TROUGH

An economical device for those whose requirements call for a compact, single position unit. Plenty of wiring room. All connectors are pressure type and take up to #1 wire. 1" or 1¼" hubs available. Melamine finish.

COMBINATION METER SOCKET AND SERVICE CONTROL EQUIPMENT

Murray meter sockets are available in combination with service control equipment. Factory assembly assures a rock-solid, perfectly aligned unit. Service control equipment includes Fully Magnetic Circuit Breakers. Murray Magnetic Breakers always carry the full load, are never affected by ambient temperatures. The sun's rays, for instance, will never cause Murray Breakers to trip. Both socket and service control equipment are finished in baked-on grey Melamine.

Murray can fill all your needs for socket type meter mounting equipment. You can choose any device you need—from the round socket to heavy duty equipment. Ordering and stocking or specifying are simplified when you buy from one source.

Murray

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1250 Atlantic Avenue, Brooklyn, New York

Please send me the catalog page and any other literature on the items listed below.

1. Outdoor Meter Socket ..... ☐
2. Outdoor Weatherproof—Raintight Socket ..... ☐
3. Heavy Duty Meter Mounting Device..... ☐
4. Outdoor Socket Meter Troughs
   - Vertical ..... ☐
   - Horizontal ..... ☐
5. Modified Outdoor Socket Meter Trough.. ☐
6. Indoor Socket Meter Trough..... ☐
7. Combination Meter Socket and Service Control Equipment ..... ☐

Name _____

Title _____

Company _____

Address _____

City _____ State _____

From West and East

One of Electrical World's goals in its engineering section is geographic distribution. Every effort is made not to get two articles from any one section of the country. In a series of articles on microwave installations in this issue EW has succeeded in getting articles from two authors who live about as far from each other as they can get and still be in the U. S. One is L. A. Carter, a communications engineer of Pacific Power & Light Co, Portland, Ore. The other is C. A. Wasserman, a senior engineer of Consolidated Gas, Electric Light & Power Co of Baltimore, Md.

Carter Likes Northwest . . . Carter is the typical booster the Pacific Northwest produces in such abundance. A graduate of Fresno State College in 1937, he went to work for PP&L as a substation operator. He then became a hydro plant operator in the eastern Cascade Mts. In some respects he considers this job to have been nearly ideal. No wonder! He had trout fishing in the front yard and pheasant hunting in the back.

After seven years in this heaven, he was transferred to other work. Since then he has handled many types of engineering assignments and has traveled around the system located in "some of the most beautiful country in the Northwest." And he insists that working for PP&L has always been interesting, sometimes difficult, but never dull. And higher praise than this no man in any industry can have for his job.

Wasserman A Baltimore Oldtimer . . . Wasserman graduated from the famous Baltimore Poly. He stayed in the city to attend Johns Hopkins and go to work for Consolidated. For 30 years he has kept abreast of the developments in the field of electronics. He has designed and built various devices employing electronic elements and has patented a voltage regulator for the control of floating voltage of central station storage batteries.

Another hobby is studying all material available on nuclear physics. For relaxation he does as many other hard workers do, turns to an easy chair and detective stories.

Electrical World

Published for 79 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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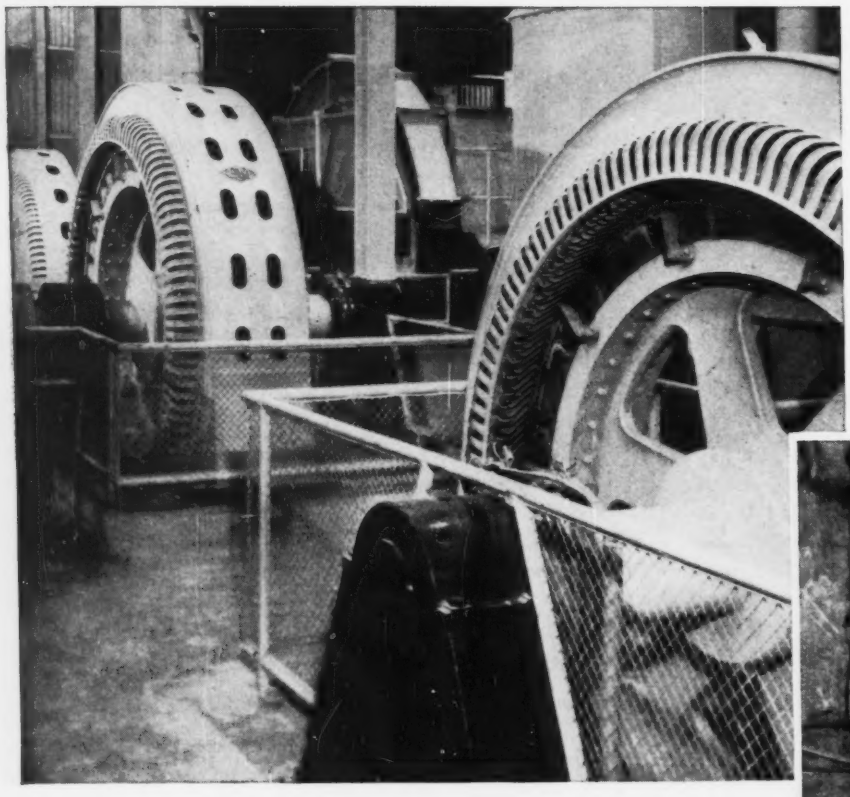
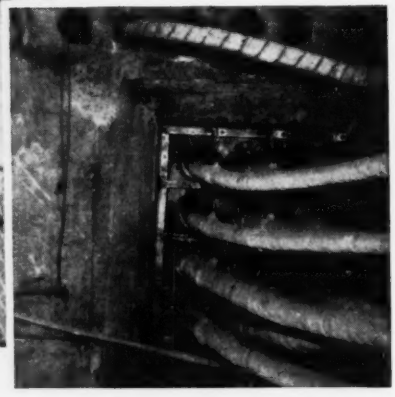


12,000 barrels of cement are produced each day at the Prospect Hill plant, Missouri Portland Cement Company, St. Louis, Mo. Okonite Cables supply power for these large, low speed synchronous motors used in the raw and finish mills.



WANTED: 24-hour, 7-day week production
SELECTED for key circuits: OKOLITE-OKOPRENE CABLES

In designing an electrical system for the Prospect Hill plant of the Missouri Portland Cement Company in St. Louis, one of the prime requirements was that it must meet the demands of continuous 24-hour, 7-day a week operation.

Discussing the need for good engineering and design, Mr. A. A. Kaspar, Chief Electrical Engineer of the Guarantee Electrical Company, the contracting engineers, says:

A. A. Kaspar

"Cost of good design is initially higher, but the difference may be offset many times over by lower maintenance cost and fewer service interruptions. Since the plant discussed here requires a 24-hour, 7-day week operation, need of good design is apparent."

Today's high costs of installation, maintenance and man-hours lost from production outages emphasize more than ever the actual savings that result from good design in your electrical system. And since good cable design is essential to reliable power distribution, Okolite-Okoprene cables are being increasingly specified.

The story of Okolite-Okoprene quality—the high voltage Okolite insulation, the tough Okoprene sheath, the exclusive strip process, the supervoltage testing—cannot be told in a few words. But the whole story can be found in Okonite's Bulletin EW-1053; we urge you to write for it today. The Okonite Company, Passaic, N. J.

The best cable is your best policy

1232

OKONITE SINCE 1878 *insulated wires and cables*

THE RIGHT TOOLS–
right when they're needed

For prompt, efficient completion of any line job, make sure your linemen have the right tools—*right* when they're needed.

And, for the easiest way to obtain this equipment, make it a point to order from Graybar. On a single transaction, you can get pliers, wrenches, shovels, and all the other tools you need for line construction and maintenance . . . safety equipment for hot-line repairs . . . even trailers and splicing carts.

By ordering through Graybar, you save the time and expense of multiple inquiries. You get products that are dependable and give long service-life—products that have been tested and accepted by linemen throughout the nation.

Your local Graybar Representative is a convenient source of information on all of the other materials required for utility pole-line projects. You'll find him well-informed on both availability and usage of the more than 100,000 electrical items distributed by Graybar.

Remember, too, that for special help on difficult problems, an experienced Graybar Outside Construction Specialist is at your service.

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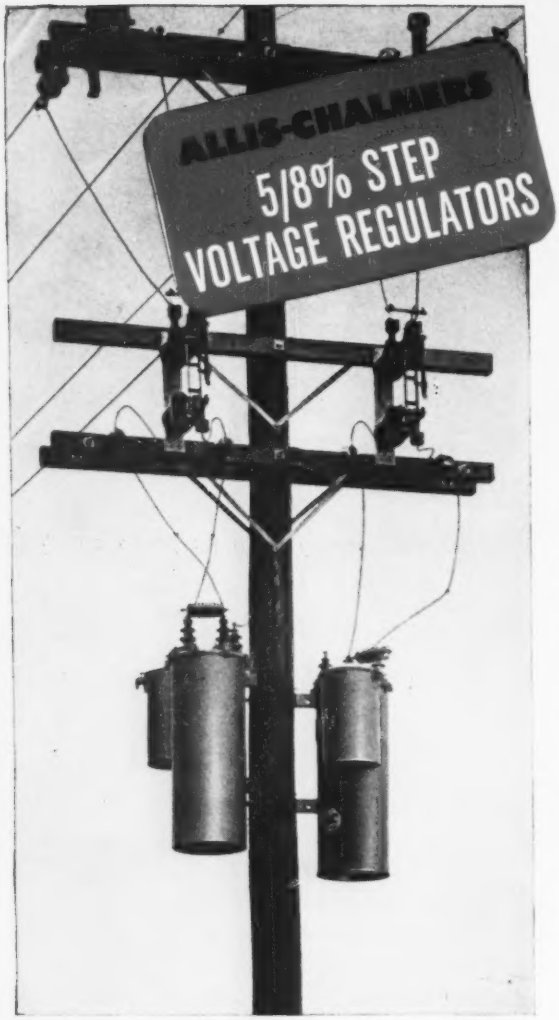


You can mount these regulators anywhere — on the ground or on a pole. Two of the three regulators for the installation shown above are on one pole; the other is on the next pole down the line.

Revenue Loss
on overloaded feeders

OVERLOADING FEEDERS at the cost of maintaining voltage is sometimes the only way you can keep up with expanding demand. It costs you revenue — and profits. You can keep revenue *up* on overloaded lines with Allis-Chalmers distribution regulators. They'll give you an accurate ± 1 volt band over a 20% operating range — plenty of room there for expansion.

Best of all, the cost is low. And installation and maintenance are easy. Simplified installation, as a matter of fact, gives you one other important advantage with Allis-Chalmers distribution regulators — they are flexible. They can be shifted from feeder to feeder easily as conditions require.

Full information is available at your nearest A-C district office. Call today or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3878

RATINGS AVAILABLE	7620 Volts—15, 50, 100 amp 5000 Volts—50, 100 amp 2500 Volts—100, 200 amp

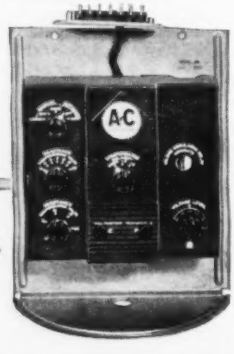
Feather-Touch Control is Friction-Free for Accuracy

Accuracy of Allis-Chalmers distribution regulator controls cannot be upset by friction because of the new regulating relay. Its design is practically friction-free. The linked dual cantilever beam bearing, which is frictionless, replaces friction-type bearings and coil springs used in other types.

LESS CLEANING AND MAINTENANCE
are required on relay contacts because they are made of platinum ruthenium. They will stand up under the type of service that causes ordinary silver contacts to become coated.

DESIGNED FOR FAST INSTALLATION
. . . there's only one adjustment to make when installing — just set the calibrated voltage level.

GET COMPLETE FACTS
on *Feather-Touch* controls. Write for Bulletin 01M7866-1.

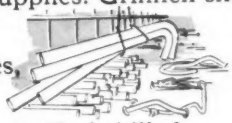
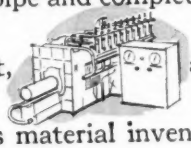
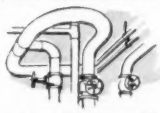


ALLIS-CHALMERS

Originators of 5/8% Step Regulation

Your WATCHDOG COMMITTEE on COSTS will approve

SHOP FABRICATION OF PIPING

because . . . both quality and economy are guaranteed. Piping is fabricated in Grinnell shops under ideal conditions, with modern equipment, by personnel qualified in all classes of work. Price (determined in advance) includes competent engineering, scheduling and shop sketches, efficient material procurement. Grinnell supplies heat, light, power, water, compressed air, expendable tools and supplies. Grinnell shops have large storage areas for pipe and completed assemblies,  expensive modern equipment,  a permanent staff of skilled workers. Grinnell finances material inventories and payrolls; carries insurance. The customer pays for no waste material or spoilage. Shop fabricated piping is rigidly inspected and tested to meet exacting requirements of customer's specifications and applicable codes. It is cleaned inside and outside and painted. Squared to standard dimensional tolerances, sub-assemblies are erected at the job site  more quickly and easily. It all adds up to this . . . shop fabrication by Grinnell guarantees quality and economy.

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industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

HOW CAN A *Friendly* MANUFACTURER HELP YOU IN YOUR BUSINESS?

We at Triangle have an old fashioned idea that what we and our distributors can *give* you—friendship, help, cooperation, is sometimes more important than the wire, cable or conduit we sell you.

That feeling is strengthened every time we get a letter saying, "You and your distributors sure helped us out of a jam" or "We can't help but tell you how much we appreciate your cooperation."

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Here are some of the things our field men, in cooperation with a nation-wide network of top electrical distributors, give, every working day—and many a night!

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No matter who you are—contractor, engineer, maintenance man—no matter who you work for—utility, city, contracting firm, large industrial—

YOU'LL LIKE DOING BUSINESS WITH TRIANGLE!

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The Trade Mark of Top Quality

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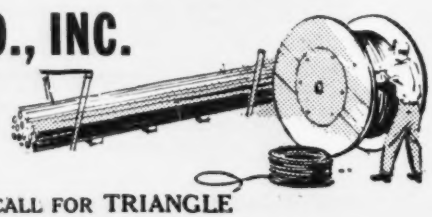
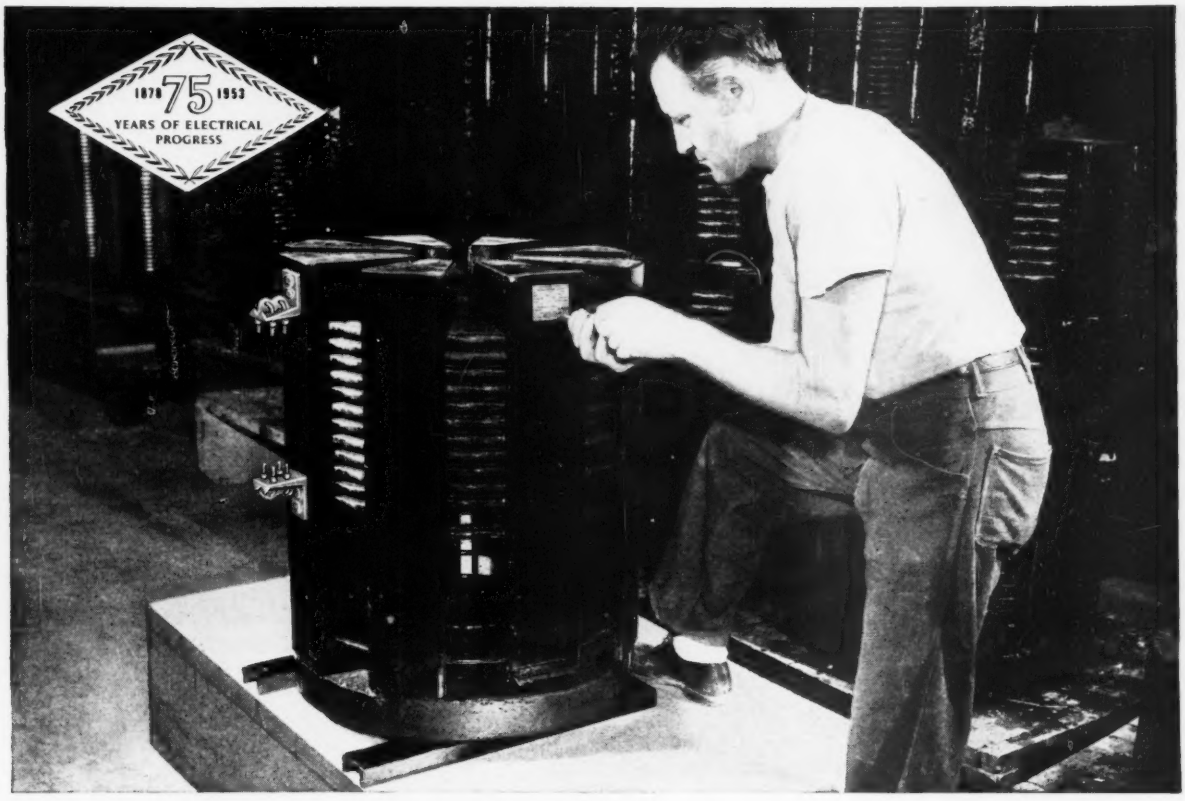


WHEN IT'S A QUESTION OF CARRYING ELECTRICAL POWER, CALL FOR TRIANGLE



Reactor shipments in 20 weeks with G-E "Repetitive Manufacture" reactors

New cast-in-concrete designs meet ASA standards C-57.16 for current-limiting reactors and AIEE-32 standards for neutral grounding devices

By applying "repetitive manufacture" techniques to its cast-in-concrete current-limiting reactors, General Electric can meet your need for faster reactor shipments. You can order RM reactors for delivery in 20 weeks—25 weeks if you desire metal enclosures.

The new RM reactors offer the same "extra service" features that have made G-E reactors industry's favorites for more than 35 years—features that give them almost unlimited life and reduce maintenance practically to zero.

Non-aging glass insulation. G-E reactors utilize glass insulation with its ability to withstand extremely high temperatures . . . its resistance to moisture . . . and its high electrical strength.

Continually transposed conductors assure more uniform current distribution. They minimize losses . . . increase short-circuit strength . . . make possible a smaller, more compact reactor.

RM reactor designs can be obtained in the 3 to 10 per cent reactance range, for 60-cycle circuits in EEI-NEMA recommended voltages up to 14.4 kv. Single-phase designs for both indoor and outdoor service; three-phase designs for indoor service only.

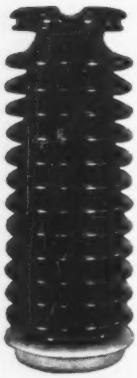
RM metal housings with provisions for cable entrance and exit can also be provided. These housings minimize stray currents and electric losses, and protect reactors against external damage.

For detailed information on the new RM reactor designs, write Section 422-1, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

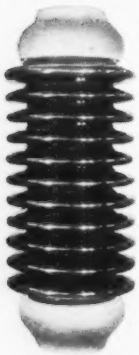
PROBLEM:

Industrial Contamination



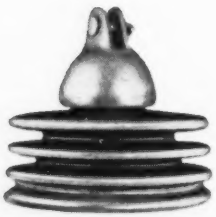
LAPP LINE POST

"All-time champion" among transmission insulators in point of service dependability at duty up to 69 kv. Its record, both on new construction and after reinsulation of lines to higher voltages, has been built on ability of Line Post to avoid leakage flashover, to withstand lightning arcover and mechanical attack, its inherent freedom from puncture and cracking.



LAPP STATION POST

In addition to the superior electrical and mechanical characteristics inherent in Lapp Post design, Station Posts also possess extra rigidity. Cap and base are externally attached for large-area low-intensity compression loading of porcelain, as contrasted to small-area, high-intensity loading of nested porcelain and metal parts in conventional pin-cap switch insulators.



LAPP FOG-TYPE SUSPENSION INSULATOR

For high-voltage lines in areas of severe contamination—salt fog, industrial fumes, or dust—Lapp Fog-Type suspension units provide maximum leakage distance per length of string—and for greater effectiveness of leakage distance, inch for inch.

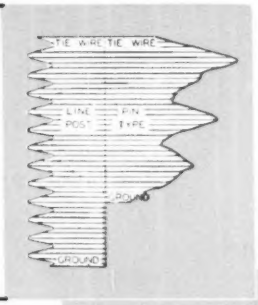
SOLUTION:

Lapp Fog-Type Design

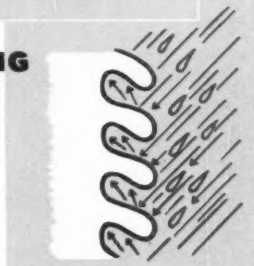
Service dependability on lines subjected to severe contamination . . . industrial smoke and fumes, dust, or salt fog . . . can be assured—without frequent cleaning of insulators—and without danger of failure from leakage flashover. Lapp Fog-Type design provides superior performance for transmission, switch and bus support because of two basic superiorities of design principle . . .

1. UNIFORM LEAKAGE PATH

Leakage flashover results from a contaminated surface which is not uniform—wet areas lower total resistance, so increase leakage current until voltage flashes over narrow shielded areas, precipitating flashover of entire unit. Compare developed uniform leakage surfaces of 66 kv Line Post (on left side) with that of conventional pin-type (right) where variation in conductivity is 3.6 times as great.



2. SELF-CLEANING

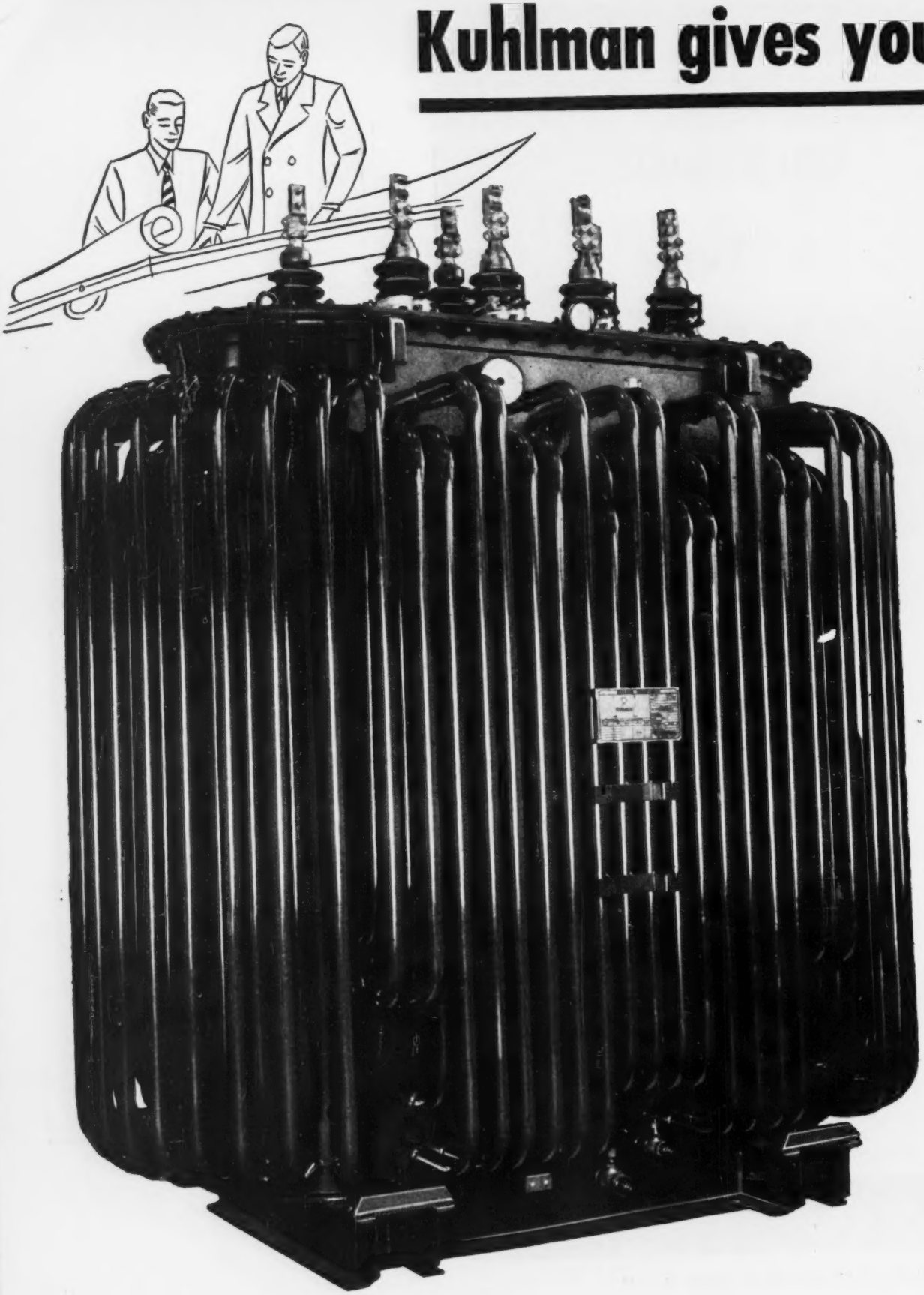


Under heavy rain and wind, contamination rapidly flushes away. Fog-Type petticoats are so shaped and spaced that rain falling on one petticoat splashes and cleans the under side of the one above. Resistance increases, leakage current falls—uniformly and over entire unit.

Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK

Kuhlman gives you



NEMA standards plus...

59 years experience building sturdy, reliable transformers

You can get a transformer that conforms to NEMA Standard almost anywhere. Transformer manufacturers conform to these standards, but you get certain "plus values" when you use Kuhlman power transformers. For instance, the Kuhlman Electric Company has been building transformers since 1894, shortly after the very first transformer was installed at Great Barrington, Massachusetts.

And for 59 years Kuhlman has been designing and building transformers to meet the requirements of utility and industrial users.

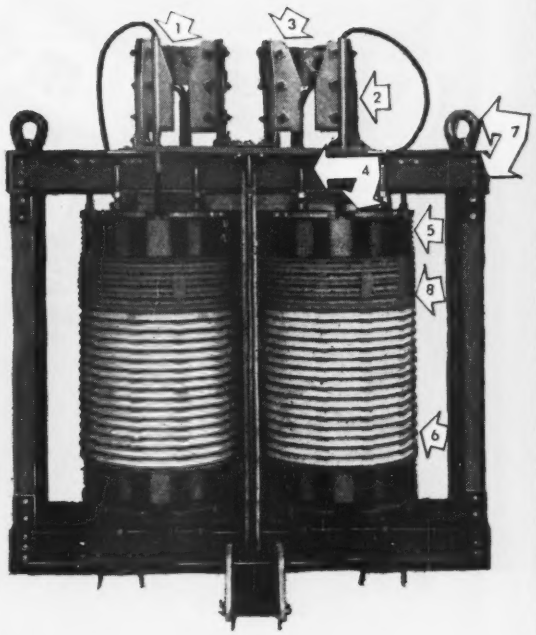
That's a lot of experience. It has resulted in power transformers that not only conform to the minimum NEMA requirements, but which have a high reputation for efficiency, reliability, and functional simplicity. Kuhlman engineers overlook no details in designing and building power transformers which will give you many years of efficient, dependable service. It is chiefly because of Kuhlman's use of approved and accepted design principles, carefully selected and tested materials, painstaking assembly, and thorough testing and inspection that you get a transformer of rigid, sturdy construction — the "plus value" which is the result of 59 years' experience.

The structural steel core clamps, which secure the core-and-coil assembly and anchor it to the tank, are the main source of sturdiness in Kuhlman power transformers.

Lock spacers, inserted between the coil sections, increase the strength of the coil and add to the over-all sturdiness of the transformer.

The tank is made from heavy steel plate. All cooling tubes and seams are electrically welded, providing oil-tight and rust-proof joints. The surfaces are shot-blasted and covered with a rust-inhibitive primer and two coats of corrosion-resistant paint.

Specify Kuhlman for your next transformer installation. Write us for the name of your nearest Kuhlman representative. And for further details about Kuhlman power transformers, ask for Bulletin CS-601.



CONSTRUCTION DETAILS

1. **Tap changer board — made of special heat resistant material developed by Kuhlman. Won't crack under high Class A insulation temperature.**
2. **Terminal board supports — made of grade A press board.**
3. **Fibre bolts — combine high electrical and mechanical strength.**
4. **Clamp jack screws and steel clamping plates — supply easily adjustable coil pressure top and bottom.**
5. **Porcelain blocking posts — offer increased creepage strength.**
6. **Lock spacers — firmly anchored between coil sections add to over-all construction strength.**
7. **Rigid core clamps with lifting lugs — provide mechanical strength and ease of handling.**
8. **Reinforced end coils — protect the transformer from surge potentials.**

Kuhlman

ELECTRIC COMPANY
BAY CITY, MICHIGAN
CRYSTAL SPRINGS, MISSISSIPPI

Export Representatives: *International Standard Electric Corporation,*
50 Church Street, 15th Floor, New York 4, New York
Cable address: Microphone, N. Y.

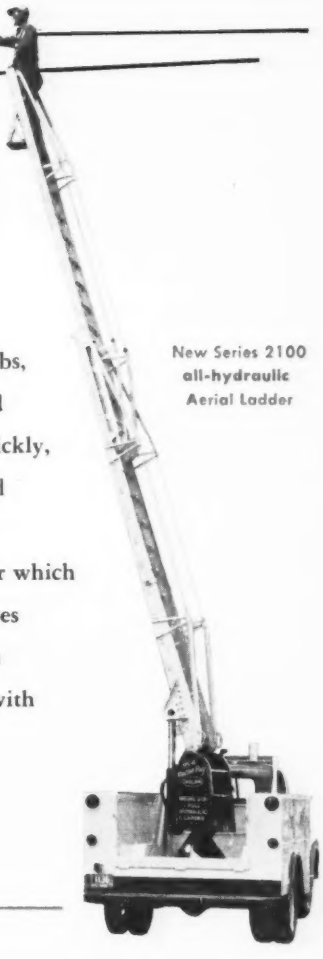
Approved
by
UNDERWRITERS
LABORATORIES
The men who USE them know the difference!
They like this—
BETTER DESIGN
If you have ever spliced wires and cables in real mean locations, you probably are a strong "booster" for Penn-Union Connectors - - -
Because you know how much easier they are to use in close quarters: Working up against a wall...squeezing into small boxes, to join short ends of stiff wire . . . reaching around pipes, and splicing wires in dark holes where you can hardly see.
LARGER SURFACES
for the wrenches make the Penn-Union connector more practical—you grip it from ANY angle, with ANY kind of wrench (box, socket or open-end). Developed by 20 years of constant improvement. Accurately made, with rigid engineering inspection. Reusable over and over. Can be furnished in Bronze or Aluminum.
Far More in use than any other
Sold by Leading Wholesalers
PENN-UNION ELECTRIC CORP.
ERIE, PA.
Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto
The Complete Line of Conductor Fittings
PENN-UNION

UP and at it!

the easy way

Series H.T.
Heavy-Duty
Hydraulic Towers

Wherever construction, maintenance or service personnel must be spotted quickly and safely on aerial jobs, Holan Hydraulics are favorite with men and management. They are raised and located quickly, with minimum effort. They are retracted and moved to the next job without delay. The engineered simplicity and strength for which the name Holan is famous assures a long life of low-cost, high-return service. Towers or ladders, with choice of several sizes.



New Series 2100
all-hydraulic
Aerial Ladder

Holan Heavy-Duty hydraulic towers have stationary, rotary or transverse platforms. Extra rigid telescoping box channel type lift. A choice of models with maximum platform heights of 17', 23' 6", or 30'. All can be lowered to 10' 3".

In the new Series 2100 all-hydraulic ladder, every motion, rotation, elevation, extension *and retraction* is hydraulically actuated. Powered by integral gasoline engine, or by power take-off. Choice of 27', 31' or 35' *platform height*.

The dependable name in utility bodies

J. H. HOLAN CORPORATION

BODIES AND ACCESSORIES FOR UTILITIES
4100 West 150th Street — Cleveland 11, Ohio

DISTRIBUTORS

Baker Equipment Engineering Co.
Summit and Norfolk Sts., Richmond, Va.

Baker Equipment Engineering Co.
2401 Hutchinson Ave., Charlotte, N. C.

Baker Equipment Engineering Co.
Shop Road, Columbia, S. C.

Schetky Equipment Corp.
1810 S. E. 10th Ave., Portland 14, Ore.

DISTRICT SALES REPRESENTATIVES

2754 N. 92nd Street
Milwaukee 10, Wis.

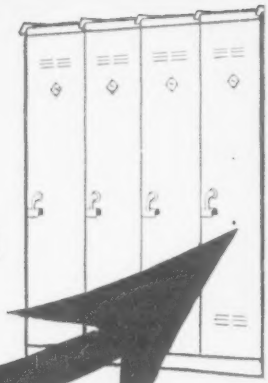
863 Wilson Drive
New Orleans, Louisiana

6-03 161st Street
Beechhurst, Queens, N. Y.

It's Easy to Add Feeders

ON AN ALLIS-CHALMERS UNIT SUB

When System Growth
Demands Additional Substations,
Install Allis-Chalmers Unit Subs.
They are Simple to Specify,
Time-Saving to Install and Easy to Expand
for Future Needs.



WHEN LOAD GROWTH MEANS EXPANSION . . . add substations designed to do more than just meet your immediate needs — add Allis-Chalmers Unit Substations with built-in flexibility for the future.

Then when future residential or industrial growth necessitates additional feeders, they will be easy to add. Each feeder of an Allis-Chalmers Substation is a complete unit in itself and is easy to install.

Here's How Feeders Are Added

Remove the bolted-on plates that cover the pre-cut bus and wiring openings . . . also remove the roof splice plate from the end feeder. Now bring the new feeder into position. You'll find correct alignment is easy, insured by jig-built construction. Replacing the gasketed roof-splicing plate completes mechanical connections.

Electrical connections are also simple to make. The predrilled, silver-plated bus extensions are bolted together. Easy-to-apply no-corona tape and insulating tape finish the joint. There's no compound to melt, chip, scrape, or crack. Control wiring is easy to connect because terminal blocks are grouped . . . located for ready access.

That's it! Connect feeder cables and the job is done.

MCS Unit Substations are a convenient answer to the growing distribution problem . . . to the ever increasing demand for power and yet more power. They are simple to specify, neat and modern in appearance, easy to expand, and they save you money these five ways:

(1) Original equipment cost is low; (2) compact construction reduces space requirements and real estate costs; (3) pre-wired unit design speeds installation; (4) maintenance is quick and economical because of improved accessibility, and (5) you purchase only the feeders you need *now*, deferring additional expenses until load growth demands them.

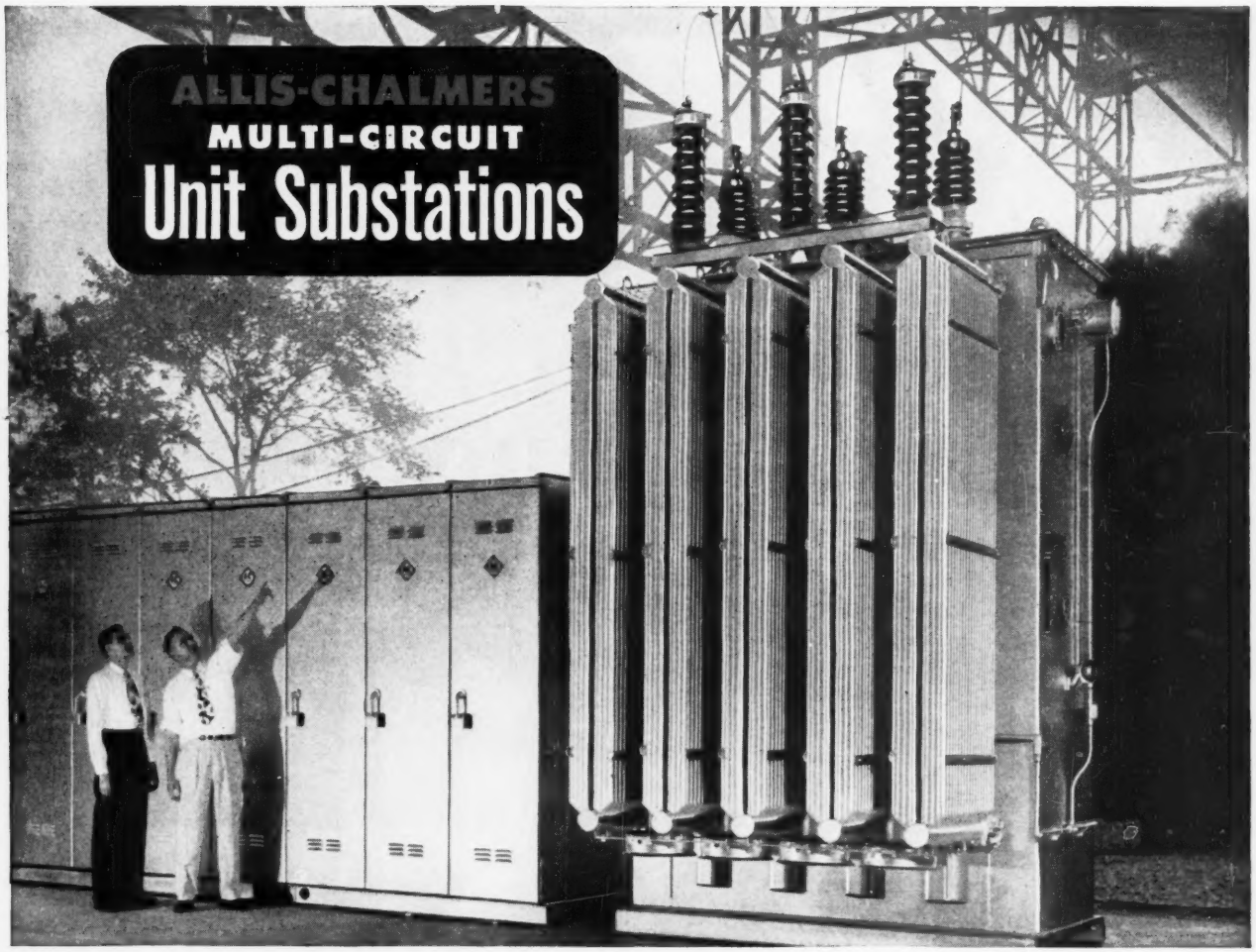
For the full story on what Allis-Chalmers Unit Substations can mean in your distribution system, call your nearby A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3544

ALLIS-

ALLIS-CHALMERS

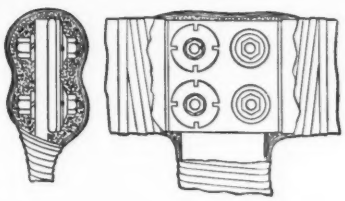
MULTI-CIRCUIT

Unit Substations

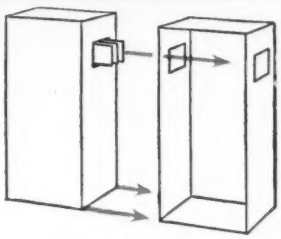


Here's Why Feeders are Easy to Add...

1 **FEEDER UNITS** are jig-built so that each feeder cubicle is exactly like every other one. Bus extension openings, control wiring openings . . . even small screw holes . . . are pre-cut in jigs. This careful, uniform construction makes field assembly easy. Just move the new feeders into position. Alignment is perfect.



2 **BUS JOINTS** are easy-to-make in the field. Bus extensions are pre-drilled and silver-plated . . . designed for quick, easy bolting together. No-corona tape covers the bolted joint . . . speeds the job by providing a smooth taping surface. Insulating tape finishes the joint. There's no compound to melt or apply.



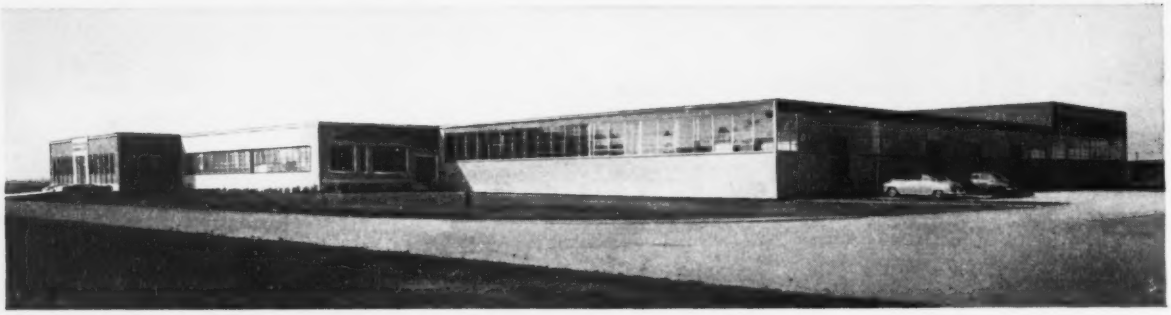
3 **EACH FEEDER** is an individual unit . . . complete with two side panels, roof and floor. All enclosed parts are protected from the weather, dust or mechanical injury even during the last minutes of installation. Gasketed roof-splicing pieces fit easily into place forming a weatherproof seal.

CHALMERS

A-C ALLIS CHALMERS

GOULD OPENS 21ST PLANT

TO MEET INDUSTRIAL BATTERY DEMAND



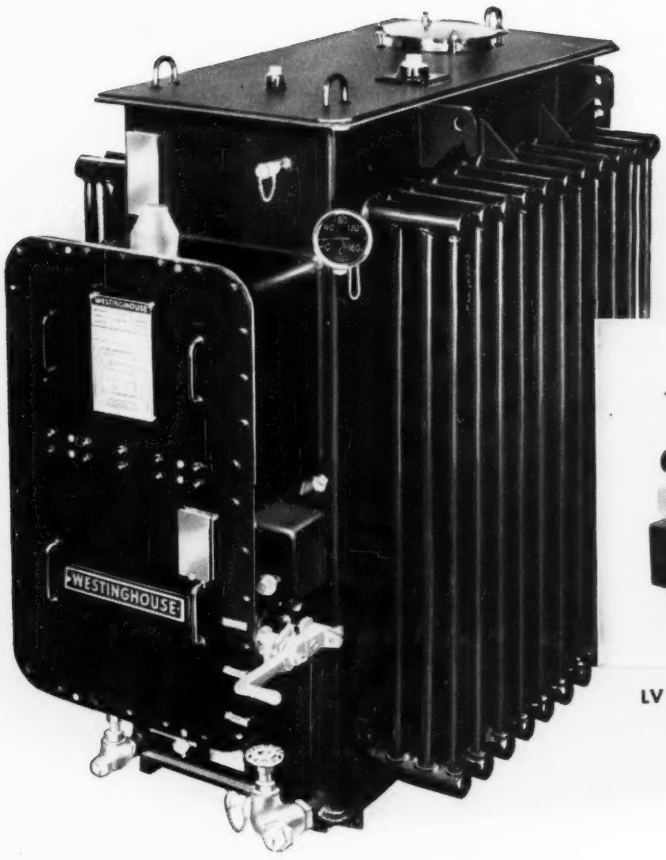
Front and side views of Gould's new Kankakee, Ill., plant

GOULD'S NEW KANKAKEE PLANT which went into production on November 10 is the 21st Gould plant in the United States and Canada. Devoted entirely to the manufacture of storage batteries for industry, it gives Gould the additional capacity necessary to meet the increased demand for Gould batteries in all parts of the country. Thanks to these new facilities, Gould customers can expect even faster service than before.

GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries



LV Bushing Shipping Cover

QUALITY in the transformer ADDS RELIABILITY to the network

Everyone agrees that when you install a network system, you install *the best* for reliability and service continuity.

But the degree of reliability...or, more exactly, the freedom from maintenance, depends directly on quality in the transformers.

That's why Westinghouse Network Transformers have continuously wound coils of sliverless copper, to guard against hot spots, crystallization and pricked or scored insulation. That's why they're high-frequency tested, too.

In addition, Westinghouse Transformers are filled under vacuum, and have welded-on covers to assure a perfect seal. Finishes are not only baked for longer life, but bases are undercoated.

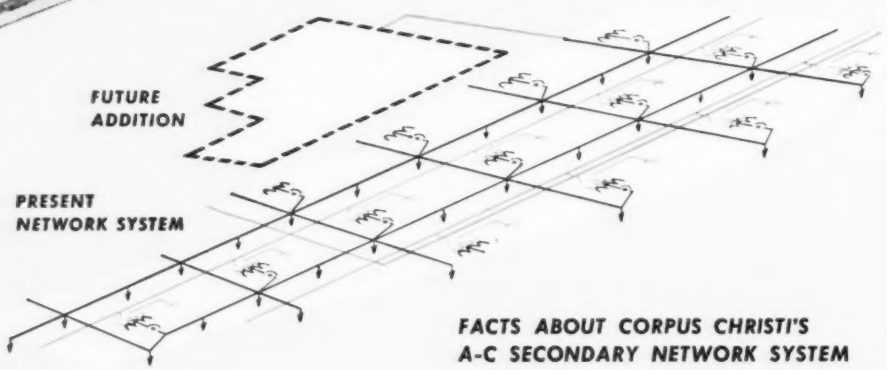
There are many other features such as the LV bushing shipping cover, shown above, that assure safe delivery of the quality built into Westinghouse Network Transformers. Your Westinghouse representative will be glad to give you full information, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70646

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK TRANSFORMERS

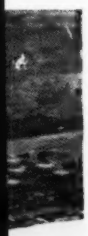
NETWORK SYSTEMS PAY... IN *Corpus Christi*



FACTS ABOUT CORPUS CHRISTI'S A-C SECONDARY NETWORK SYSTEM

The new network encompasses the area roughly below the Bluff from Mann Street to Born Street consisting of 43 blocks, (see large white area). The flexibility of the A-C Secondary Network System will permit the inclusion of 12 more blocks above the Bluff, (see dotted area). Thus far, the underground network system contains thirty-two subway-type network transformers and protectors and vaults.

Converting Growth Problems into Load Profits!



Rapid growth, including the construction of many new buildings and the addition of large loads such as air-conditioning units, brought the downtown overhead electric distribution system in Corpus Christi, Texas, to the practical limits of its expansion three years ago. Because of the unprecedented demand, the existing 2300-volt overhead radial system proved inadequate. There are no alleys in downtown Corpus Christi; streets were cluttered with poles and wires. In some cases, several sets of secondary mains were involved on the same street. Voltage regulation and service continuity problems were acute.

CAREFUL SYSTEM PLANNING by Central Power and Light Company indicated an underground network, supplied by a higher primary voltage, as the desirable long-term solution. In 1949 they embarked on a three-year program, installing a 12,480-volt primary. Four underground feeders were brought in from the Nueces Bay Power Plant to the new, downtown, A-C Secondary Network System. Because of tidewater conditions, this 43-block area presented serious construction and operation problems. The transformers are subway type, 500 kva, 3 phase, with throat-mounted submersible, 1600-ampere, 125/216-volt network protectors.

CENTRAL POWER AND LIGHT COMPANY now is able to provide customers with uninterrupted power supply . . . previous problems and unsightly pole lines have disappeared! The network system has proved as practical and economical as anticipated. In short, Corpus Christi has solved future load-growth problems . . . the utility now is ready to more economically serve its increasing load.

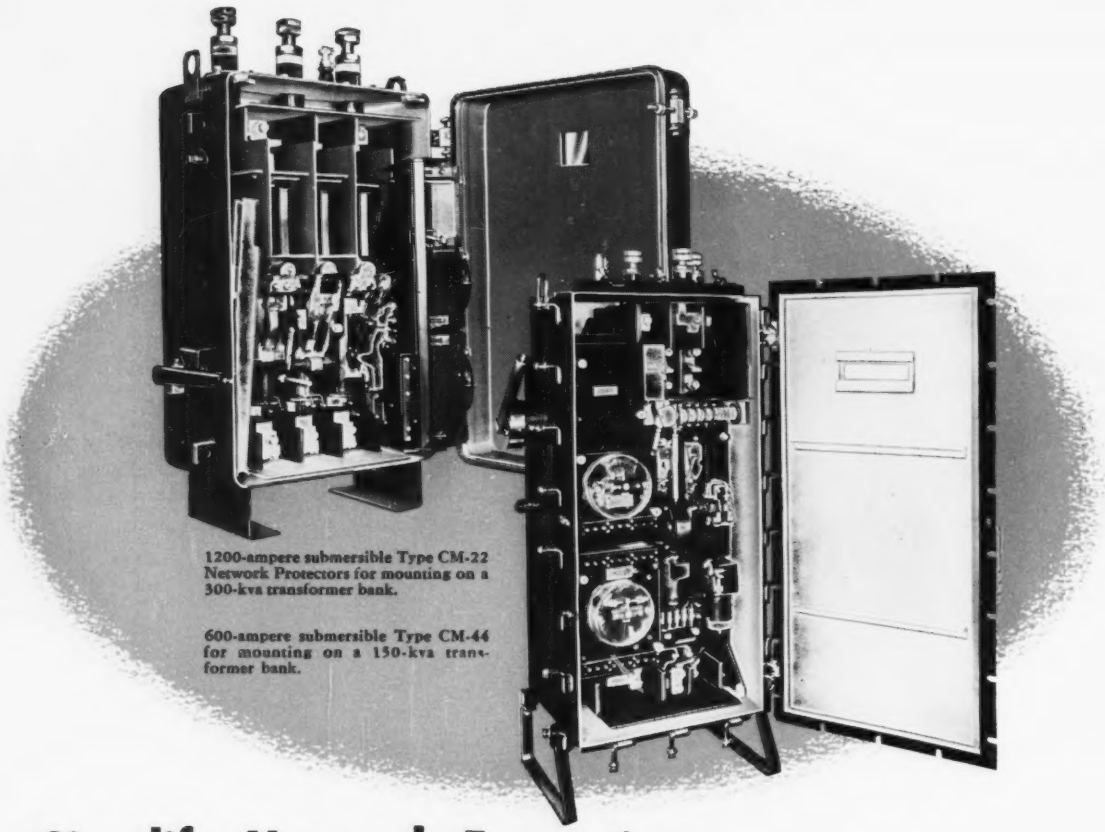
THE RANGE OF WESTINGHOUSE NETWORK EQUIPMENT enables you to employ the type of network system that best suits your future needs. Booklet B-4002, "A-C Secondary Network Systems", contains complete information about the flexibility and many advantages of this system. Our engineers are ready to help you in your network system planning. Call your nearby Westinghouse office, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-97158

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK EQUIPMENT



1200-ampere submersible Type CM-22 Network Protectors for mounting on a 300-kva transformer bank.

600-ampere submersible Type CM-44 for mounting on a 150-kva transformer bank.

Simplify Network Expansion with Westinghouse NETWORK PROTECTORS

You can expand your network system simply—and economically—with Westinghouse Network Protectors. The reason—Westinghouse heavy-duty and medium-duty protector use the same relays. Hence, as load grows medium-duty (CM-44) protectors can be replaced with heavy-duty (CM-22) protectors and suitable transformers—*without upsetting system co-ordination!* CM-44 units may then be moved to lighter load areas.

Keep this important Westinghouse feature in mind as YOU plan your network system. It's a *sure* way to provide for simple, low-cost expansion of that system when load conditions dictate.

Ask your Westinghouse representative for further information . . . or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-60778

ONLY WESTINGHOUSE NETWORK RELAYS . . .

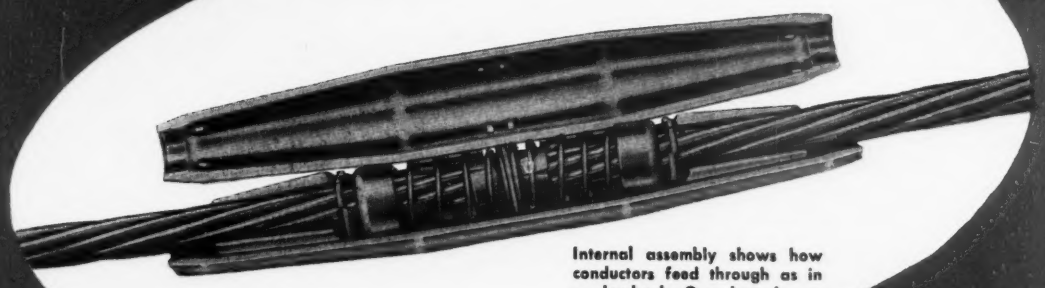
- Eliminate gears that cause friction and wear.
- Have a sensitive reverse-current setting that can be varied from .1% to 10% of the network protector rating.
- Have bearing surfaces readily accessible for inspection and cleaning.
- Have relay terminal screws that eliminate the need for additional testing facilities in the control wiring.
- Provide a nonsensitive relay that permits sensitive tripping after a time-delay.

YOU CAN BE SURE . . . IF IT'S

Westinghouse

NETWORK PROTECTORS

Reliable LIFTS THE LID on a New STRAIGHTLINE Splice



Internal assembly shows how conductors feed through as in a deadend. One jaw is removed for a better view.

SPLICE OPERATES LIKE A PAIR OF BACK-TO-BACK STRAIGHT-THRU DEADENDS

The new "55" Series Straightline Splice is the surest splice yet devised for strand . . . and *still* no tools are required.

FEATURES:

1. Burred, bent, or out-of-lay strands are either properly located or are refused by pilot cups.
2. Pilot cups prevent jaws from gripping conductor until conductor is "home".
3. Complete closure prevents entry of gritty materials that can interfere with proper functioning of gripping jaws.
4. With only a straight push conductors reach "home" with a definite *feel* and *sound*.

Write for new bulletin giving complete information. Reliable will gladly give you a demonstration — simply ask for it on your company letterhead.

Reliable ELECTRIC COMPANY
3145 CARROLL AVENUE
CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES

CORONA IS

Protect Your Power Transformer

with

CORONA *free*

DESIGN

SLOW, STEADY ATTACKS OF CORONA deep within your transformer can age it and bring it to the point of breakdown.

Corona ionizes and chars insulation. This further lowers insulation resistance and permits the insulation to conduct progressively more electricity. When that happens, breakdown is just a matter of time.

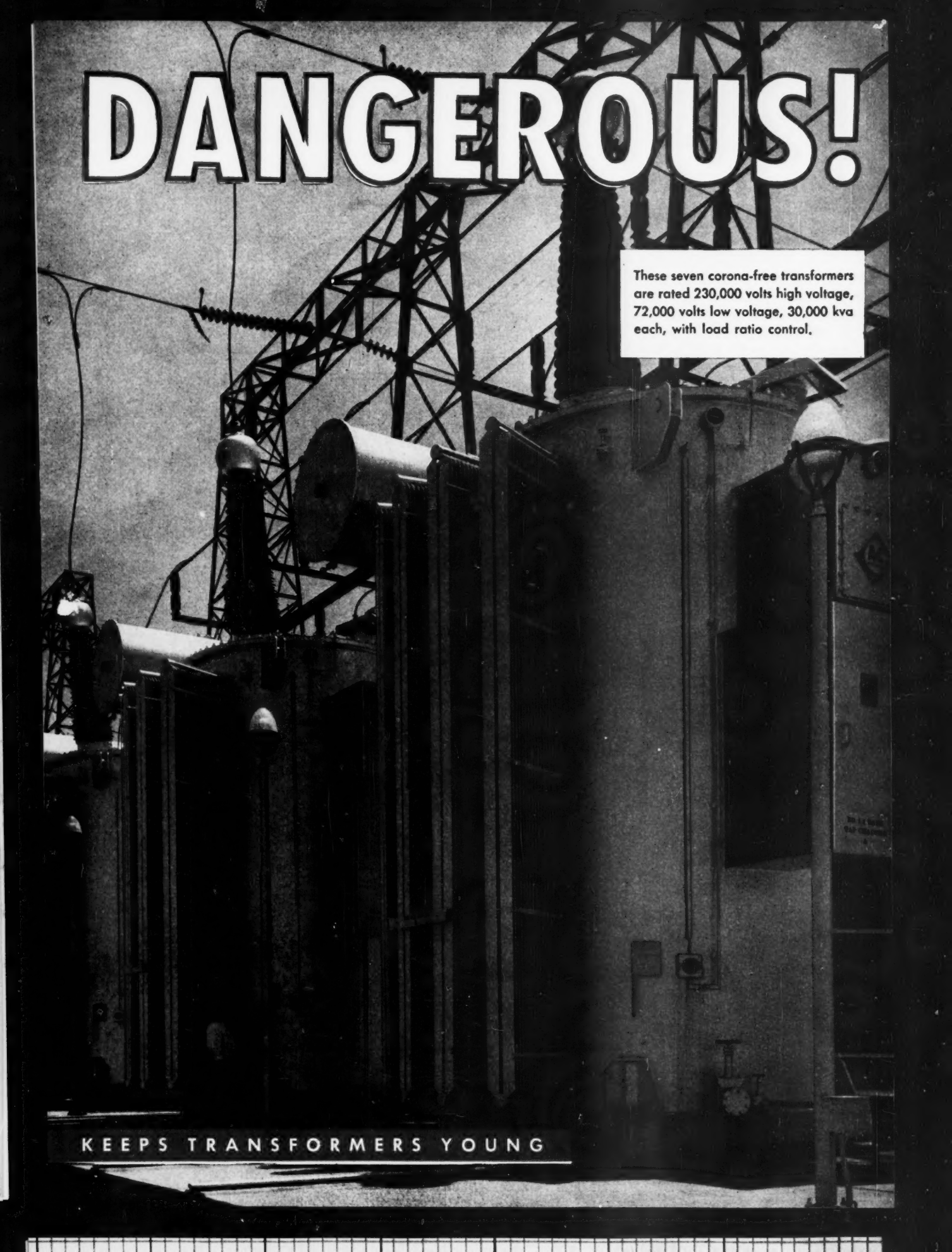
These facts are important reasons why you'll want your next power transformer to have corona-free design.

You can have full assurance that corona won't steal life from your transformer. Corona-free design will protect your transformer up to 100% of maximum test voltage. You *can* obtain the power transformer that will maintain full strength and last for years without growing old.

A-3908

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN


DANGEROUS!
These seven corona-free transformers are rated 230,000 volts high voltage, 72,000 volts low voltage, 30,000 kva each, with load ratio control.
KEEPS TRANSFORMERS YOUNG

ANNOUNCING

A new Dodge truck parade of power!

NEW! More powerful engines!

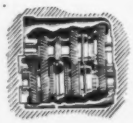
A parade of power! See the new Dodge "*Job-Rated*" trucks at your Dodge dealer's today. A total of 7 big, rarin'-to-go engines, including 3 brand-new power plants with high compression ratios and higher horsepower, greater cooling capacity, increased displacement, twin carburetion available on larger models. Plus famous features like 4-ring pistons with chrome-plated top ring, exhaust valve seat inserts.

In addition, the new Dodge trucks offer outstanding new brakes, new no-shift transmission, and over 50 other new features. See your Dodge dealer for the biggest truck buy on record!

For a truck, ½-ton through 4-ton that fits the job, see the NEW...

NEW! Extra-powerful brakes!

Stop easily on steep grades, fully loaded. Super-safe brakes give silky-smooth braking, reduced driver fatigue, greater load protection . . . new increased stopping ability on 1- through 2½-ton trucks! *PLUS* Dodge's oversize braking surface with Cyclebond linings.



NEW! Truck-o-matic transmission!

New Truck-o-matic transmission . . . available on ½- and ¾-ton models of Dodge "*Job-Rated*" trucks . . . saves shifting, cuts driver fatigue, lets you rock out of snow, mud, sand. Only Dodge offers shift-free Truck-o-matic! *PLUS* famous gyrol Fluid Drive, to lengthen truck life, protect your load.

NEW! Over 50 features!

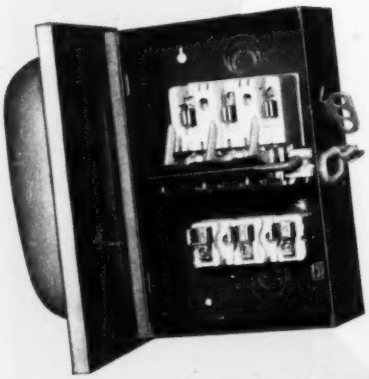
50 ways new! Reinforced cab construction, improved exhaust system, extra-capacity radiators. Tinted glass, heaters with stepped-up heat output available. *PLUS* moistureproof ignition, high-torque capacity starting motors, and other dependability features. See your Dodge dealer.

DODGE "Job-Rated" TRUCKS

Now on display at Your Dodge Dealer's!

3 LINES OF SAFETY SWITCHES *for* 3 DIFFERENT MARKETS

one line can't do two or three jobs without compromising price and performance!

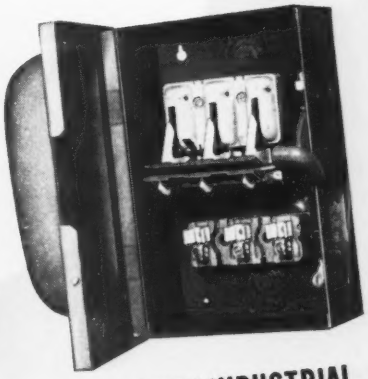


GENERAL PURPOSE

90,000 line designed for residential, commercial and other applications where price is limiting and the service factor is not great.

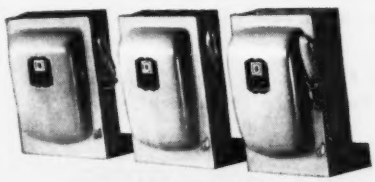
INDUSTRIAL

40,000 line designed for general industrial or institutional and commercial applications where the service factor is greater and price is an important consideration. MEETS BOTH GOVERNMENT AND NEMA SPECIFICATIONS FOR TYPE A SWITCHES.



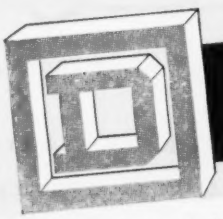
HEAVY-DUTY INDUSTRIAL

80,000 and 50,000 line designed for mass production industries where price is secondary to continued performance under conditions of severe service and maximum safety. The 50,000 line is used where space is limited. BOTH ARE TYPE A but go far beyond those requirements.



UNIFORM STYLING

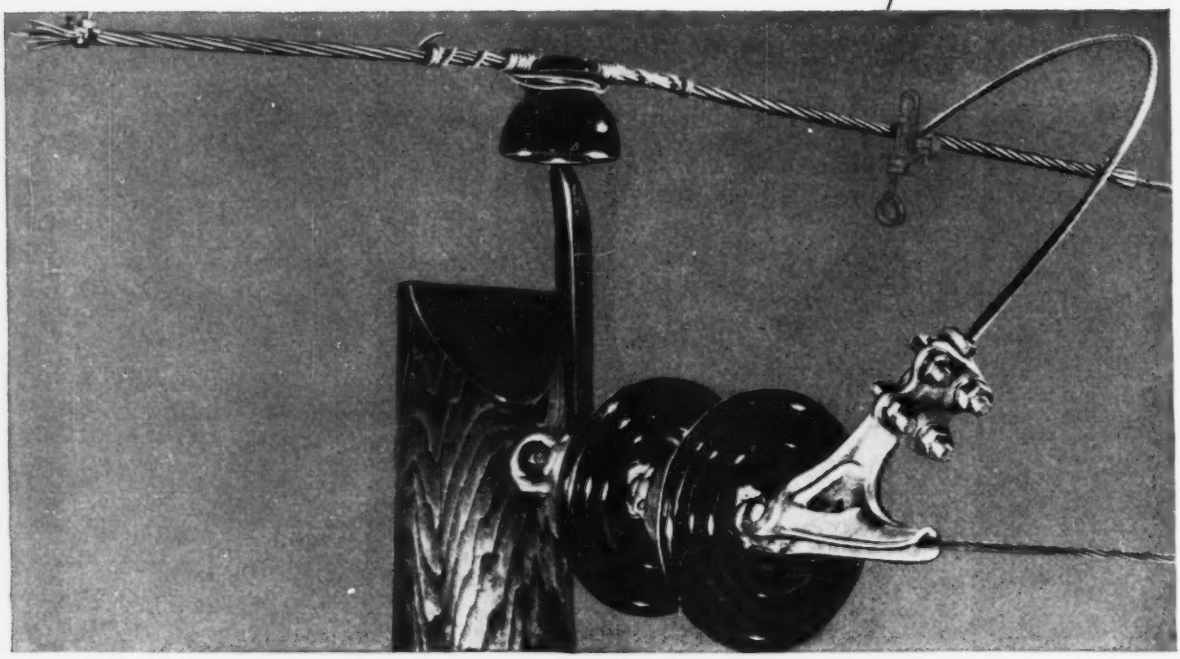
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS



SQUARE D COMPANY

ACSR

and Alcoa Accessories



When you buy aluminum conductors from Alcoa, you can fill all your requirements in a single transaction—and be sure you're getting the right accessories. For Alcoa originated both aluminum conductors and accessories . . . continues to develop and improve them.

Designed for best service, there's an Alcoa accessory for every need. Alcoa backs them up with experienced design, laboratory and manufacturing facilities.

Call your Alcoa sales office for aluminum conductors *and* for accessories that are right —on the line.

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Alcoa Aluminum

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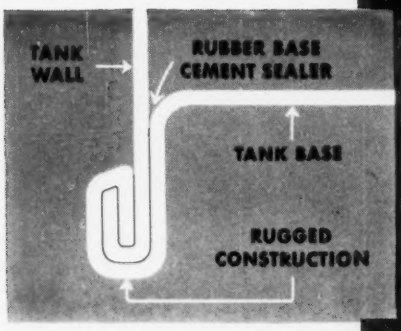

These rolls squeeze trouble out

Of course you don't drop transformers off tail gates, or skid them across concrete floors and roadways. That is, you don't plan for these things to happen. But experience shows they sometimes do.

That's why machines like the one above roll a double seam, joining the base to the tank of every Westinghouse Distribution Transformer. As the rolls squeeze down, they compress a rubber cement applied to the surface of the metal. This cement fills up any capillary spaces which might normally exist.

Result: A positive seal to prevent any leakage . . . a reinforced base as a protection against severe handling . . . additional protection against corrosion at a vulnerable point.

This is another of the extra values like Coastal Finish, extra-strength bushings, and many more, that contribute to the trouble-free dependability of Westinghouse Transformers. They add up to better service, less servicing. Your Westinghouse Representative will be glad to give you further information about these features, or write for Booklet B-4249A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70658

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Westinghouse

DISTRIBUTION TRANSFORMERS

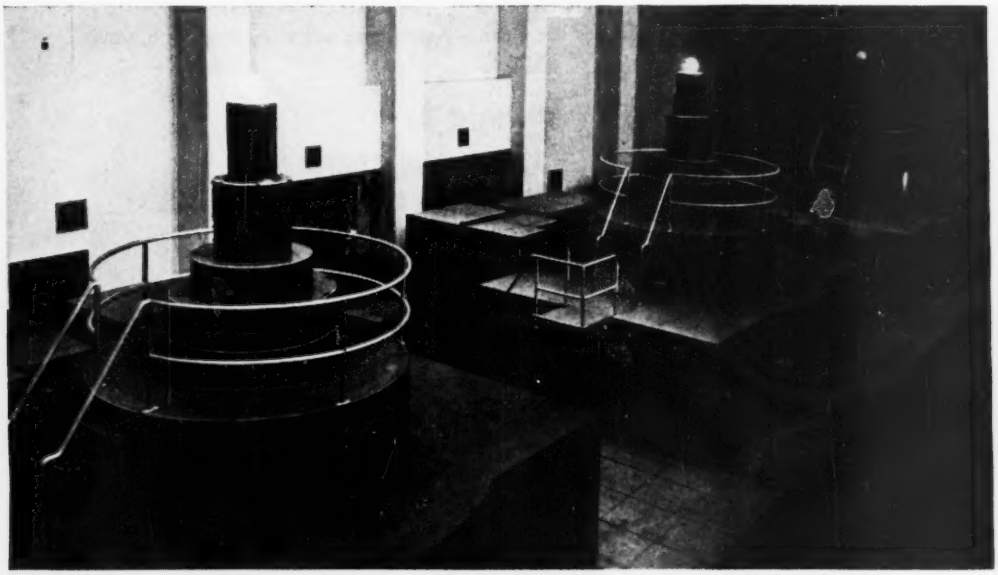
KORTES DAM features

"Mountain-goat country" describes the type of territory in which Kortes is located on the North Platte River, 60 miles southwest of Casper, Wyoming. The dam and power plant were constructed under most difficult conditions, easily apparent in this photograph. The constant threat of falling rock loosened by frost is averted by deflecting ribs of concrete and also by a four-foot thick concrete roof over the power plant.

In addition to the Kortes Dam plant, Elliott generators will also serve Alcova Dam and Power Plant, another unit in the chain, now under construction.

three ELLIOTT generators

The first link in the vast Missouri Basin Project for power, flood control and reclamation, starts operation. ELLIOTT generators will also serve other related plants in the chain.



The three Elliott vertical generating units at Kortes. They are the first to supply power in the Bureau of Reclamation's big Missouri Basin development.

THREE ELLIOTT VERTICAL GENERATORS driven by Francis-Type turbines, transform formerly wasted water power into valuable electric energy at Kortes. Each is rated 13,333 kva, .9 pf, 12,000 kw, 3 phase, 60 cycle, 6900 volts at 240 rpm. Thrust bearings are located above the rotor, and guide-bearings in upper and lower bracket oil pots. Two air-to-water heat exchangers for each unit handle all cooling needs. A field test on one of the generators showed operating efficiency considerably beyond specified requirements.

The Missouri Basin Project covers part or all of ten states, in an area thirten times the size of the Tennessee Valley. The selection of Elliott generators to serve the Kortes Dam station as well as others still to be completed, is significant of the confidence which Elliott products have won in the highest engineering circles.

For details on Elliott generators and motors, contact your local Elliott representative or write Elliott Company, Ridgway, Pa.

ELLIOTT Company

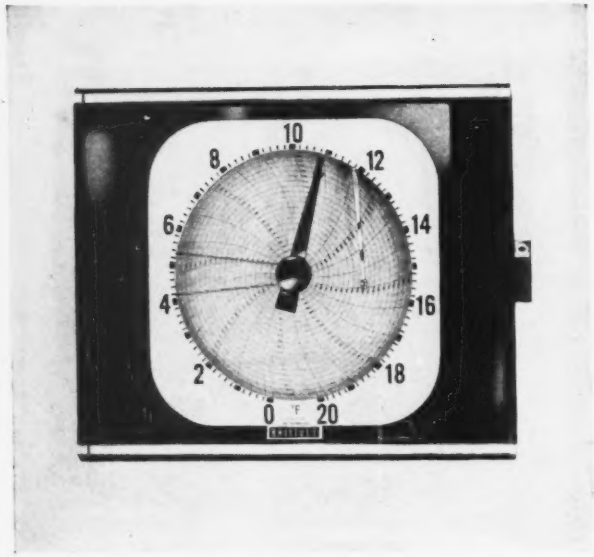
R2-12

RIDGWAY DIVISION

BRISTOL ELECTRONIC

DYNAMASTER POTENTIOMETERS

feature Continuous Standardization!



advantage 1:

No dry cells to fuss with . . .

thanks to Bristol's constant voltage source, which is continuously compared with the voltage of a standard cell.

advantage 2:

Continuous operation . . .

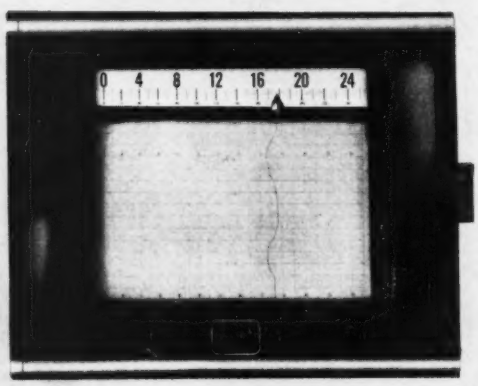
no interruptions for standardization.

advantage 3:

No standardizing mechanism

No wonder the Dynamaster is the finest-performing potentiometer on the market!

BRISTOL DYNAMASTER with round (above) and strip (right) charts feature identical components and units, except for the chart drive.



Bristol Electronic Dynamaster Potentiometers for every use!

Recorders—single and multiple records and two continuous ink records;

Electric Controllers — on-off and all types of proportioning control;

Air-Operated Controllers—on-off, proportional (0 to 30% and 0 to 100%), reset, derivative, and reset plus derivative control actions.

Write for free Catalog P1245 to The Bristol Company, 116 Bristol Road, Waterbury 20, Conn.

BRISTOL

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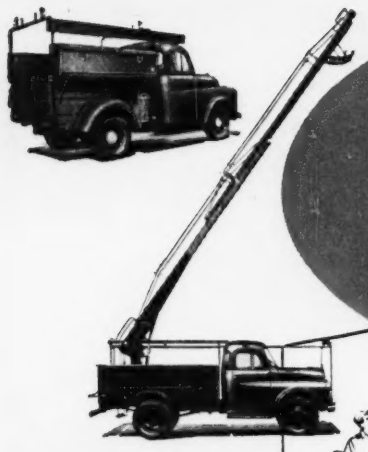
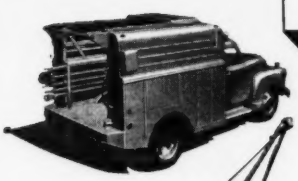


the 1 source for all types of utility bodies and equipment!



Whatever your utility body needs may be . . . from a set of compartment sections for a pick-up truck to a line body capable of handling the largest construction job . . . there's a POWERS-American Body designed to meet your requirements.

Available for construction, maintenance, and service work in all phases of the public utility industry, POWERS-American Bodies are "job-engineered" to step up crew efficiency and lower operation costs. Their quality construction guarantees long life and trouble-free service.

Whether your needs be large or small, standard or special, you'll find it a real economy to call POWERS-American . . . the 1 source for all types of utility bodies and equipment.

Look at all the features you get in POWERS-American Bodies

"Job-engineered" design • Equalized load distribution • Extra large weathertight compartments • Triple-seal compartment doors • Recessed slam-action door catches, with cylinder locks keyed alike • Additional line body features include: low-positioned rubber goods compartment • Full-size compartments on street side • Derrick stowed without interference to cab door or loss of compartment space • Extra depth in all compartments • Horizontal compartments for long material.

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Resistance Tests

0.1 megohm to 1,000,000 megohms

Photograph by courtesy of Synthane Corporation. With aid of Type 544 Megohm Bridge, engineer determines resistance to leakage across and through insulating materials, under constant temperature and humidity conditions.

The GR Type 544-B Megohm Bridge is an accurate, simple-to-operate, portable test instrument for measuring resistances in the megohm ranges. Among its many uses are the testing of cartridge type resistors — insulation resistance measurements on electrical machinery, generators, motors, and transformers — insulation study of single conductors, cables, and long sections of high voltage cables — measurements on capacitors and slabs of insulating materials.

The instrument is basically a Wheatstone bridge with special adaptations for insulation resistance testing.

Type 544-BA Megohm Bridge with A-C Power Supply $340

Type 544-BB Megohm Bridge with Batteries $250

Sensitivity: A very sensitive vacuum-tube voltmeter, used as the null detector, permits measurement of resistances as high as 1,000,000 megohms. Resistance values are read directly from a dial and five-position multiplier switch for rapid and convenient measurements. The scale is approximately logarithmic with an effective length of 38 inches.

Accuracy: ±3% from 0.1 megohm to 100 megohms, ±4% from 100 to 10,000 megohms. Above 10,000 megohms, accuracy is essentially that with which scale can be read.

Simplicity of Operation: The CHECK position is for adjusting galvanometer zero. The OPERATE position is for measurements. In the CHARGE position either 100 or 500 volts is supplied directly to the unknown for any desired length of time.

Power Supply: The bridge operates directly from a completely self-contained a-c or d-c power supply. A-c unit delivers d-c test voltages of 500, the ASTM standard, or 100 volts for testing insulation of low dielectric strength. This voltage is held constant regardless of the value of the unknown. Battery power supplies 90 volts for the test voltage. All high-voltage terminals are insulated for operators' protection.

Guard Terminal: This third terminal is very useful when three terminal networks such as multi-wire cables and multi-circuit transformers are being measured.

Accessories Supplied: Seven-foot line cord with a-c supply, spare fuses, test probe and spare neon ballast tube.

Dimensions: 8½" (width) x 22½" (length) x 8" (height) overall.

Net Weight: 26⅜ pounds with a-c supply; 29½ pounds with batteries.

GENERAL RADIO Company

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Admittance Meters ☆ Coaxial Elements ☆ Decade Capacitors
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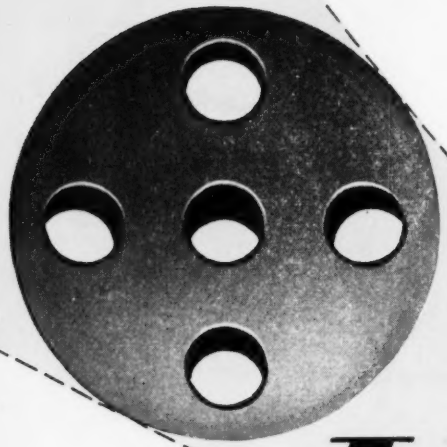
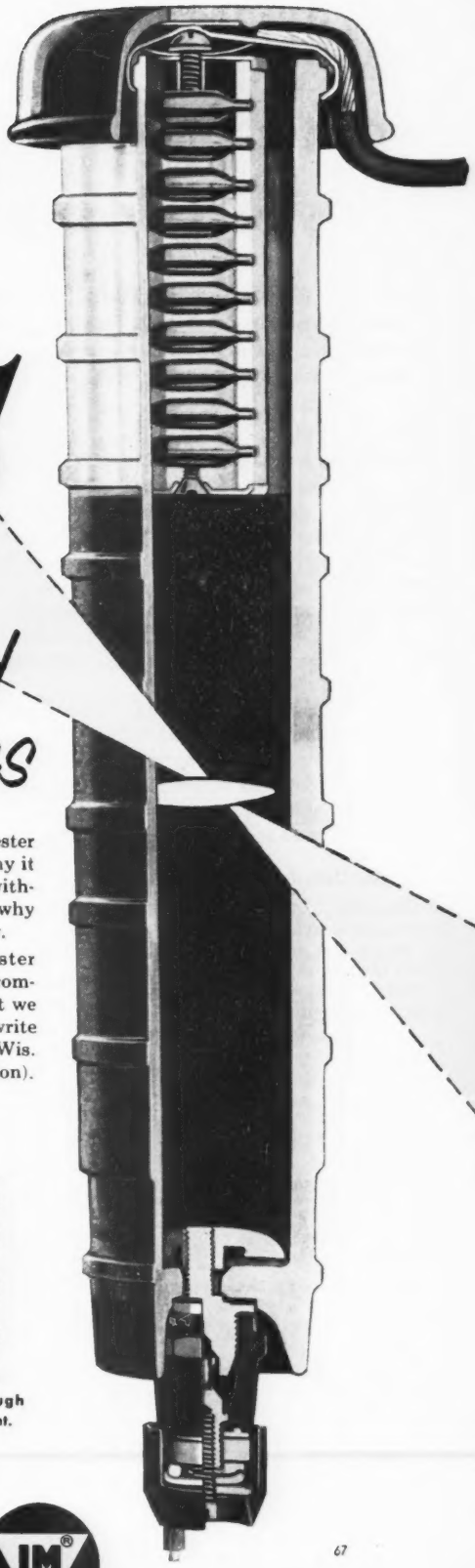
Pulse Generators ☆ Signal Generators ☆ Vibration Meters ☆ Stroboscopes ☆ Wave Filters
U-H-F Measuring Equipment ☆ V-T Voltmeters ☆ Wave Analyzers ☆ Polariscopes



the only lightning arrester with the LENS that gives it such high discharge capacity and unchanging characteristics



An ingeniously designed lens electrode is placed in the valve element of *every* L-M valve type arrester. This exclusive L-M feature performs an extremely valuable function that accounts for the exceptional performance and long life of L-M arresters.

Here's why. Lightning surge current tends to "skin" down the outside of the valve element, just as 60-cycle current will flow on the skin of a conductor. This results in only a small portion of the valve element being used to handle lightning surges. Thus the surge capacity of what might be a good arrester is materially lowered—the valve element will fail in time due to the excessive concentration of current on the outer skin.

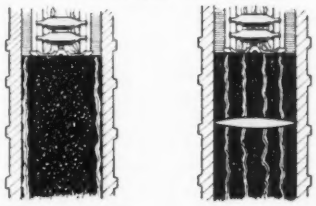
The L-M lens electrode completely counteracts lightning surge current "skin effect." The full cross-section of the valve element is available for extremely high surges—considerably in excess of 65,000 amperes.

The lens does the job. It distributes the surge evenly throughout the valve element—doesn't allow it to concentrate in any one path and thus clinker the element.

That's one reason why an L-M arrester can take more and heavier surges—why it maintains its high discharge capacity without change, for years and years . . . why its rate of failure is so gratifyingly low.

Get the whole story on L-M arrester performance, including some utility company records which substantiate what we say. Ask the L-M Field Engineer, or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

Here's What Happens



Without LENS
Surge channels down sides of element.

With LENS
Surge goes through the entire element.

LINE MATERIAL
Lightning Arresters

Complete Coordinated Equipment for Distribution Today

67

NOW...L-M offers complete line of Secondary Racks –conforming with EEI specifications

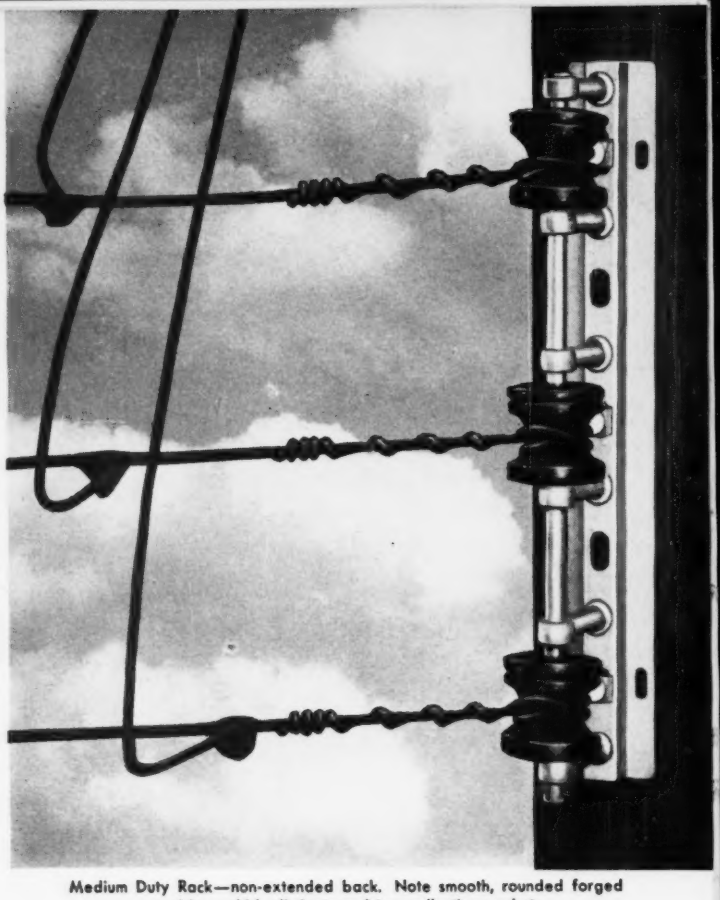
Medium and Heavy Duty Types feature forged-leg construction. Light Duty is riveted, pressed steel U type... all give greater strength, higher resistance to corrosion, neater appearance.

Your L-M Field Engineer is now prepared to offer you a complete line of Secondary Racks—with forged legs in the medium and heavy duty types.

These L-M racks fully conform to dimensional specifications and meet or exceed strength requirements outlined in EEI Specification TD-7. They are hot-dip galvanized. Edges are smoothly rounded to eliminate danger of damage to rope lines and conductors. The forged-leg design eliminates all pockets which would otherwise collect moisture and encourage corrosion when the racks are installed.

The L-M medium duty rack has ample strength for most urban construction, even in heavy loading districts. L-M heavy duty racks are recommended for use where construction standards require this superior strength.

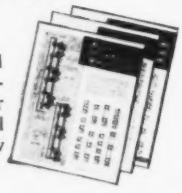
L-M light duty racks are strong, well built, have curved steel backs and U-supports of 3/16″ steel.



Medium Duty Rack—non-extended back. Note smooth, rounded forged steel legs which eliminate moisture-collecting pockets.

Get Details and Dimensions

Specifications, dimensions and fully illustrated catalog sheets are available on all L-M Secondary Racks. Ask your L-M Field Engineer for copies of this material, or write: Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today

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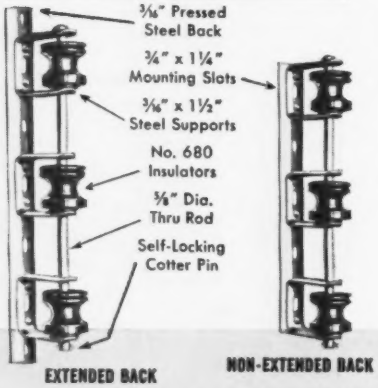
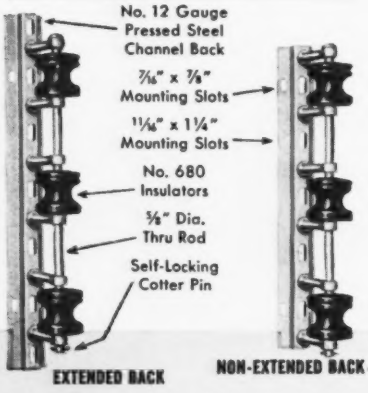
LIGHT DUTY



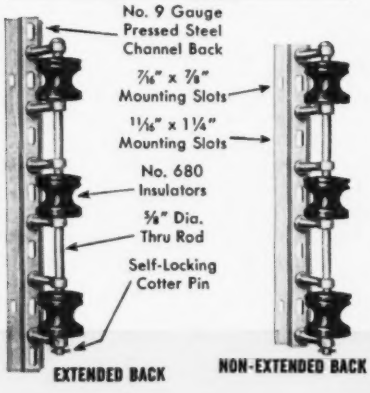
**2 Wire— 8 Inch
**3 Wire— 4 Inch
**3 Wire— 8 Inch
**3 Wire—12 Inch
**4 Wire— 8 Inch

MEDIUM DUTY


No. 12 Gauge Pressed Steel Channel Back
7/16" x 7/8" Mounting Slots
1 1/16" x 1 1/4" Mounting Slots
No. 680 Insulators
5/8" Dia. Thru Rod
Self-Locking Cotter Pin
EXTENDED BACK
NON-EXTENDED BACK

*2 Wire— 8 Inch
*3 Wire— 4 Inch
*3 Wire— 8 Inch
*3 Wire—12 Inch
*4 Wire— 8 Inch

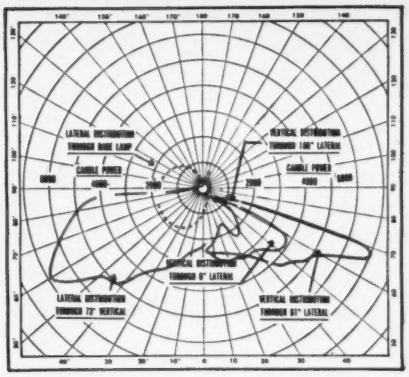
HEAVY DUTY


No. 9 Gauge Pressed Steel Channel Back
7/16" x 7/8" Mounting Slots
1 1/16" x 1 1/4" Mounting Slots
No. 680 Insulators
5/8" Dia. Thru Rod
Self-Locking Cotter Pin
EXTENDED BACK
NON-EXTENDED BACK

2 Wire— 8 Inch
3 Wire— 4 Inch
**3 Wire— 8 Inch
**3 Wire—12 Inch
**4 Wire— 8 Inch

***E.E.I. Standard in Non-Extended Type* only.**

**E.E.I. Standard in both Extended and Non-Extended Types.*



The L-M *Ovalite* takes either incandescent or horizontal-burning mercury vapor lamps. Mercury lamp is high up in the reflector. This, combined with the design of the HOLOPHANE® refractor, results in low surface brightness and less glare, and a broad light-distribution pattern as shown by the curves in the chart.

New design of L-M Ovalite gives improved light distribution for mercury vapor

The new *Ovalite* is designed for high intensity lighting over a wide area. The rectangular Alzak reflector provides asymmetric light distribution. An Alzak deflector passes the light down around, not through, the lamp. Prisms on the house side of the Holophane refractor re-direct the light toward the street. Optional magnetic arc-control feature holds the arc in the optical center.

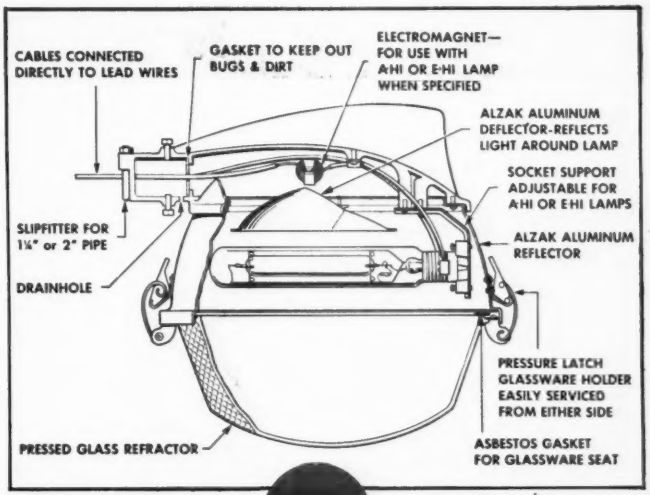
Lower mounting height—Unlike mercury vapor units with narrower distribution, the *Ovalite* provides wide IES type IV distribution. This means that the *Ovalite* is effective at lower mounting heights of 25 to 30 feet, which saves pole costs and maintenance. The use of elevating prisms in the refractor results in low surface brightness and minimum glare.

Unusual easy-service feature—Pressure latches on both sides hold the glassware snugly. Either latch acts as a hinge when the other is opened, permitting service from either side. An exclusive L-M feature.

Pendent or side-mounted, for either mercury or incandescent—The *Ovalite* takes mercury vapor E-H1, 20,000 lumens; A-H1, 15,000 lumens; or A-H5, 11,000 lumens; or incandescent lamps up to 15,000 lumens series. Slipfitter and pendent mountings in 1¼" or 2" sizes.

GET THIS FREE OVALITE BULLETIN

The *Ovalite* bulletin provides details on design, use, types, ballasts. Ask your L-M Field Engineer for a copy or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).


CABLES CONNECTED DIRECTLY TO LEAD WIRES
GASKET TO KEEP OUT BUGS & DIRT
ELECTROMAGNET—FOR USE WITH A-HI OR E-HI LAMP WHEN SPECIFIED
ALZAK ALUMINUM DEFLECTOR-REFLECTS LIGHT AROUND LAMP
SOCKET SUPPORT ADJUSTABLE FOR A-HI OR E-HI LAMPS
SLIPFITTER FOR 1¼" or 2" PIPE
ALZAK ALUMINUM REFLECTOR
DRAINHOLE
PRESSURE LATCH GLASSWARE HOLDER EASILY SERVICED FROM EITHER SIDE
PRESSED GLASS REFRACTOR
ASBESTOS GASKET FOR GLASSWARE SEAT

LM/82

Note the rectangular reflector, the deflector, and the mounting of lamp well up in the reflector.

LINE MATERIAL

Street Lighting

Ovalite is an L-M trademark

FIGURE 1—Earl J. Kirsch, Assistant Manager, Transformer sales, exhibits the L-M Round-Wound core-coil assembly, which provides an almost ideal magnetic circuit. The wound core has no air gaps; has stable characteristics, low exciting current. Long round coils wound directly onto the core encircle a large part of the core, making possible fewer winding turns and lower copper loss.

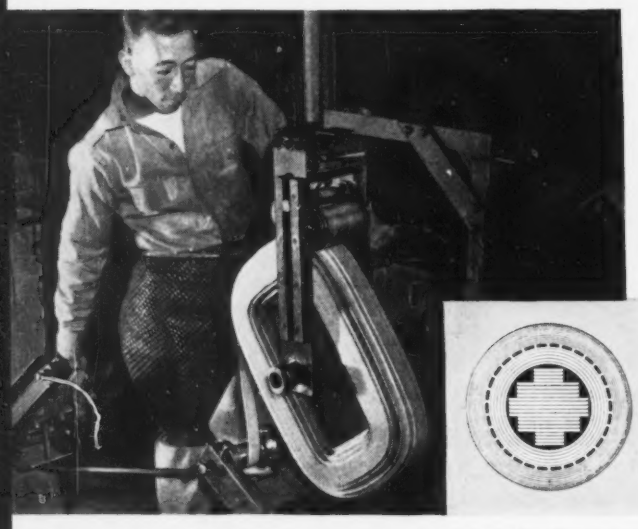


FIGURE 2—Core is tightly wound, under tension, of continuous strip of oriented silicon steel, of varying widths to provide a core of nearly round cruciform cross section.

FIGURE 3—The cross section of the wound core is cruciform, closely approximating a round form.

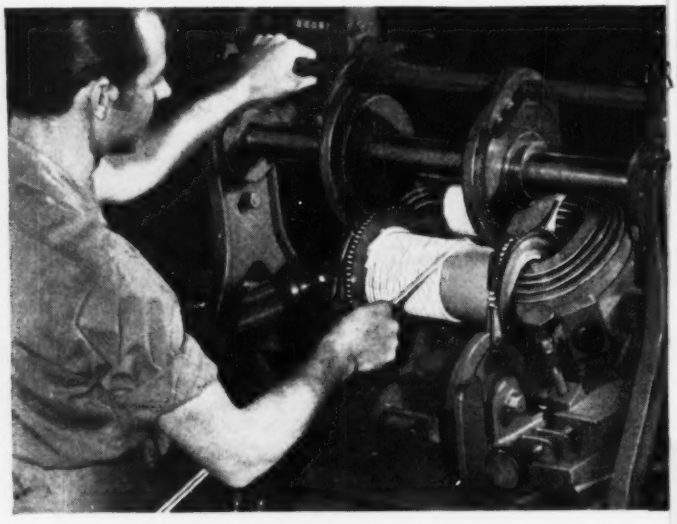


FIGURE 4—After the core is annealed, coils are wound directly on the *uncut* core, by means of split winding flanges driven by gears on the L-M exclusive winding machine.

How L-M Round-Wound Design Cuts Losses in Distribution Transformers

by **James G. Everhart**, Chief Engineer, Transformer Division, Line Material Company

Utility companies are under terrific pressure today between higher costs and higher taxes on the one hand, and lagging revenues on the other hand. Today, as never before, power must be distributed with the utmost economy, and great attention is being devoted to the reduction of every possible loss.

Transformer losses are one factor that is receiving extensive study, by both the operating companies and the manufacturers.

In this economy drive, transformer loading is also receiving major attention, with a view to maximum utilization of equipment—and this introduces another factor into the study of losses.

The Battle for Savings

The ratio of losses of a distribution transformer affects overload capacity. The copper loss watts vary as the square of the overload. In comparing two transformers of identical physical proportions including coil cooling surface exposed to oil, it is obvious that the unit with higher copper loss has less overload capacity before damaging temperatures are reached than does the transformer with lower copper loss. This effect is further emphasized by the fact the high copper loss dictates a small unit with less surface.

Core loss, on the other hand, is something the utility company pays for 24 hours a day. Therefore the designer must take both core and copper losses into account in providing the best possible balance of performance characteristics.

Exciting current, another factor in operating cost, is deserving of attention, and should be reduced to whatever extent can be done by a design that does not at the same time sacrifice other performance characteristics.

"Balanced Performance"

To meet these considerations, transformer design must essentially be a series of compromises. The L-M Round-Wound transformer consists of a wound core, with long round coils wound directly onto the core (Figure 1). This construction offers certain inherent advantages which make it possible for L-M designers to minimize compromises and offer *balanced performance*.

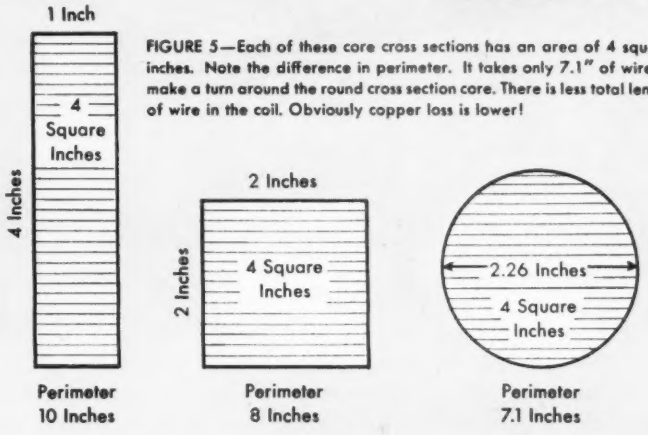


FIGURE 5—Each of these core cross sections has an area of 4 square inches. Note the difference in perimeter. It takes only 7.1" of wire to make a turn around the round cross section core. There is less total length of wire in the coil. Obviously copper loss is lower!

Wound Core Is Not Cut

First of these inherent advantages is the exclusive L-M wound core itself. It is tightly wound of continuous strip of cold rolled oriented silicon steel, with no cuts, laps, or gaps (Figure 2). This superior core makes possible the higher overload capacity and balanced losses of the Round-Wound transformer.

Lower Exciting Current

Since the core is not cut, no air gaps are created which would break up the flux path and produce higher exciting current, with consequent loss in revenue.

Low Core Loss

The higher magnetic efficiency of this core makes it possible to achieve low core loss easily, while the core at the same time contributes greatly to balanced performance. Incidentally, this continuous core is also far more quiet than one which contains air gaps.

Another advantage of the L-M wound core lies in the fact that the cross section is cruciform, approaching the round (Figure 3). Round coils are wound directly onto the core in an L-M designed winding machine (Figure 4). As shown in Figure 5, these coils allow a reduction in the perimeter of the coil and permit more efficient utilization of the copper. With the same cross section wire, and the same number of turns, there is less total length of wire, and less watts of copper loss. This is one of the inherent advantages of the L-M wound core that gives the designer more leeway in achieving a proper balance of performance characteristics.

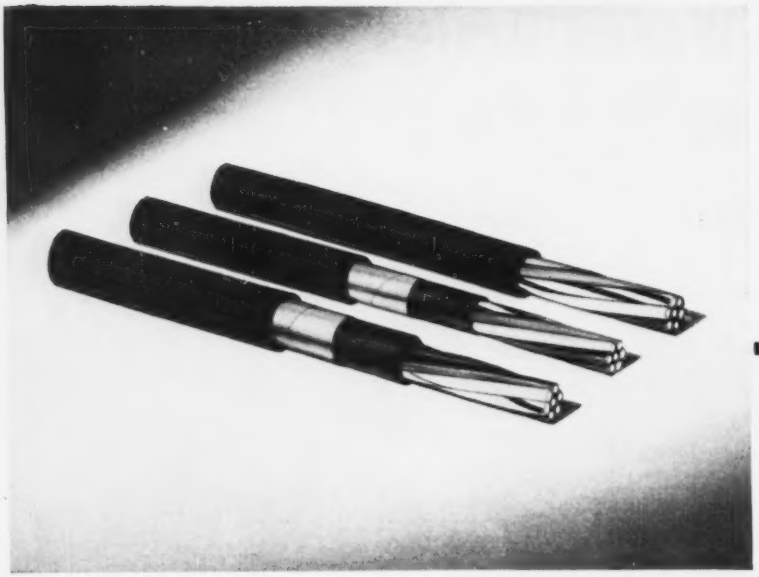
Detailed typical performance characteristics of Round-Wound transformers are available from the L-M Field Engineer, or by writing Mr. Everhart at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

"Round-Wound" is a Line Material Co. trademark.

91

LINE MATERIAL Transformers

Complete Coordinated Equipment for Distribution Today



THESE THREE ARE "A NATURAL"

for LOW COST, TROUBLE-FREE OPERATION of SIGNAL, CONTROL and COMMUNICATION CIRCUITS

Here's a list of the top quality benefits you get when you buy Simplex Polyethylene-Plastex Signal Cables. For more complete information send for our newly-revised Simplex catalog #1010 in care of the address below.

POLYETHYLENE INSULATION

- High Dielectric Strength
- Low Dielectric Constant
- Low Power Factor
- High Insulation Resistance
- Good Physical Properties
- Low Water Absorption
- Resists Oils, Chemicals, Sunlight, Aging
- Low Cracking and Shattering Temperatures
- Resists Deformation
- Permits Use of a Thin Wall

PLASTEX JACKET

- Tough yet Flexible
- Low Cracking Temperature
- Wide Temperature Range
- Resists Abrasion, Oils, Chemicals, Flame, Sunlight, Aging
- Low Water Absorption and Diffusion

COMPLETED CABLE

- Small in Diameter
- Light Weight
- Low Capacitance and Attenuation
- Electrical and Mechanical Stability
- Comes in Three Types Shown Above for Duct, Underground and Aerial Service

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.

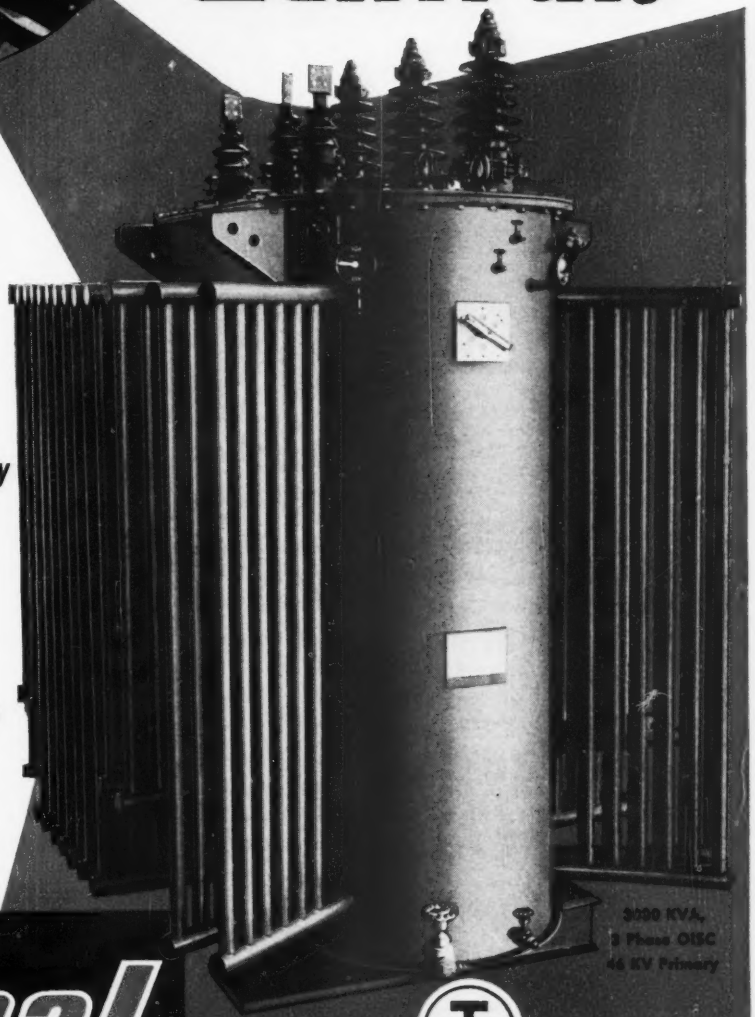
"Transformers? ...IN MY BOOK THE OUTSTANDING MAKE IS Central!"

7

Reasons for Superiority of Central Transformers

1. *Skilled, Conscientious workmanship*
2. *Tried-and-Proven Dependability*
3. *Trouble-Free Performance*
4. *Minimum Maintenance*
5. *Long Life*
6. *Reputation—Thousands in Use*
7. *Prompt, Efficient Service*

A TYPE FOR EVERY NEED



Central
TRANSFORMER CORP.
FORMERLY LARKIN LECTRO PRODUCTS CORPORATION

as we get it—it's MICA . .

it comes in chip-like flakes — in a box bearing the labels of a far off land. It's a raw material which has to be combined and shaped and formed until

as you get it . . . it's MICA PLUS

and the PLUS is MACALLEN

a degree of dependability that can result only from knowledge reduced to controlled standardized processes, and high accuracy to facilitate easy assembly

when you think of MICA . . . think of MACALLEN

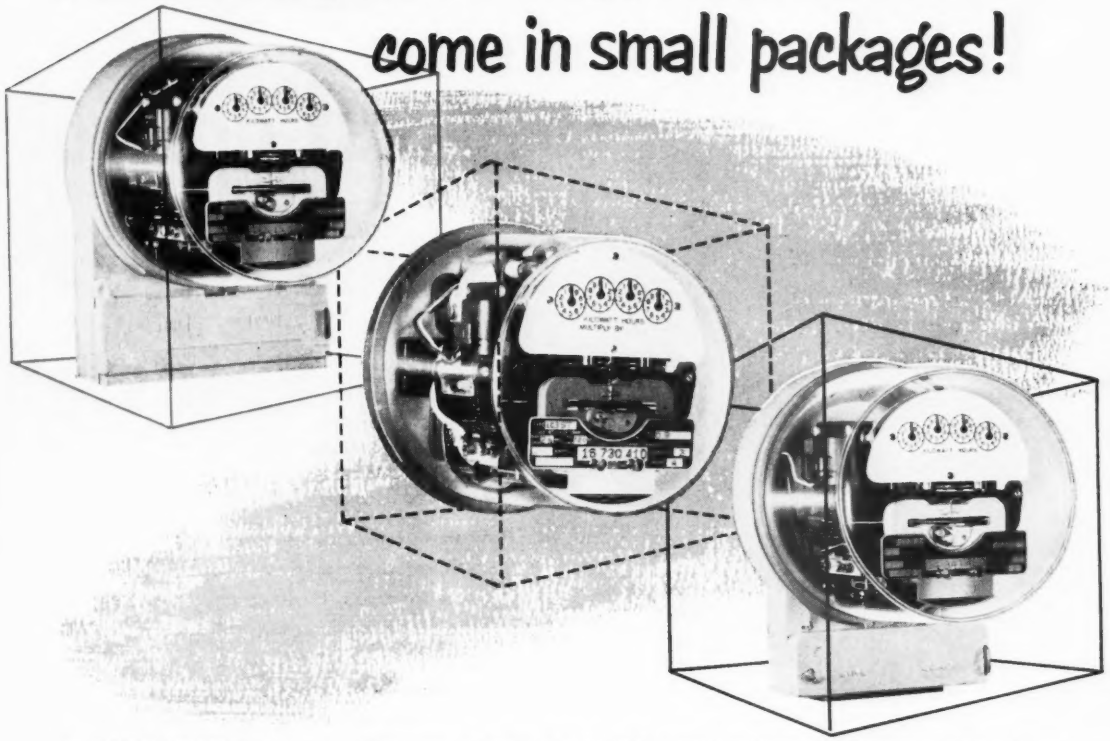
MACALLEN MICA

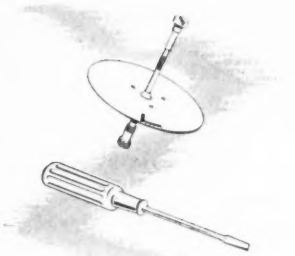
ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE

THE MACALLEN COMPANY
16 MACALLEN STREET • BOSTON 27, MASS.

CHICAGO: 565 W. WASHINGTON BLVD.
CLEVELAND: 1231 SUPERIOR AVE.

All Sangamo Polyphase Meters come in small packages!





Because of their single disk construction, *all* Sangamo Polyphase Meters, whether 2, 2½, or 3 element, come in the smaller sizes required of modern power meters. This saves installation time and expense. For example, on change-overs to 4-wire network systems, the Sangamo LC-3 Element Meter will fit in exactly the same space as the delta 2 element meter which it replaces.

Besides the smaller size and lighter weight, the use of but a single disk also increases bearing life, lessens the effect from friction on light loads, and provides stability of calibration.

Too, there is the convenience of all adjustments, including the micrometer adjustments for full load, light load, inductive load, and element balance, being readily accessible—with just a screwdriver—enabling easy testing on the premises.

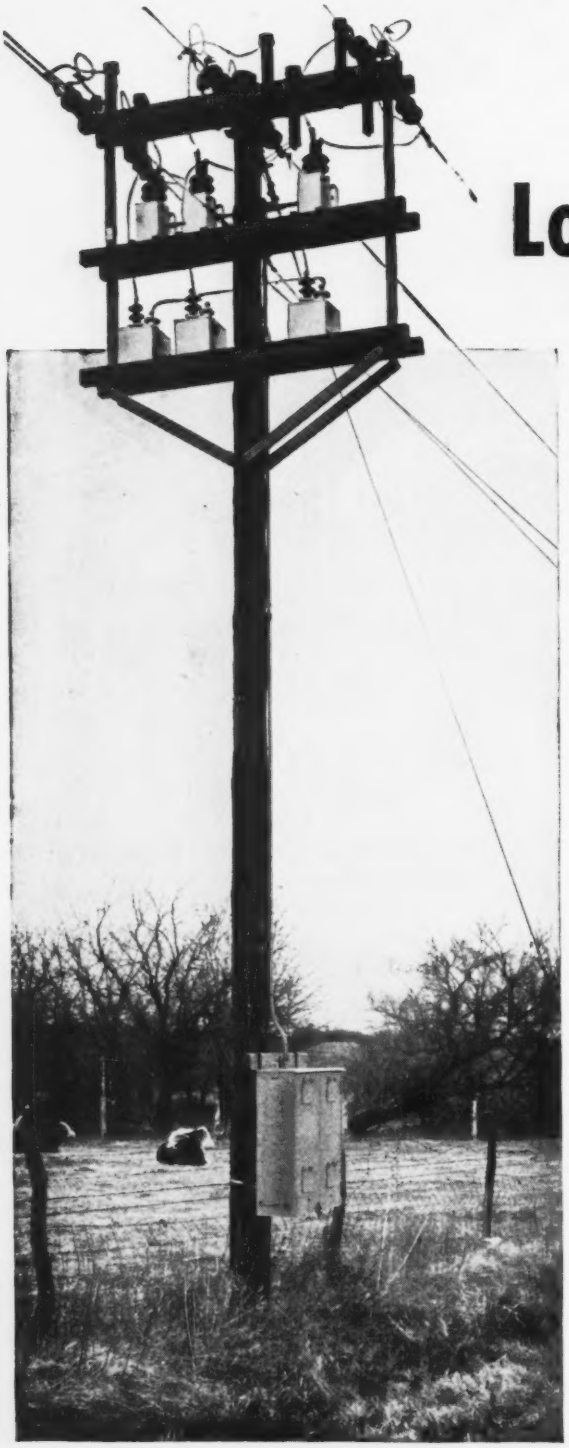
And if it should be necessary to install your polyphase meters in locations of extreme exposure to corrosive industrial or salt atmospheres, you can now expect much longer meter life because of the new corrosion-resistant finishes with which all Sangamo Meters are treated.

For more detailed information on Sangamo Polyphase Meters ask your Sangamo Representative.

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts

SM53-1



Low-cost accuracy; neat and easy to install!

Low installation costs and strict accuracy have been linked together in Westinghouse Instrument Transformers for years. Basic construction features like top-mounted HV bushings simplify connections . . . make neat installations. Here, time and effort are saved by bolting the Current Transformers to the middle cross-arm and the Potential Transformers to the lower. Wiring is practically straight through. In addition, design features, like vacuum plastic impregnation, eliminate maintenance problems. The Midwestern utility using these transformers bought them on the basis of *low initial cost* and *ease of installation.* Its Meter Superintendent reports that metering has been "most accurate."

Westinghouse Instrument Transformers offer you the most complete line in the Industry . . . each type and rating is designed for a specific need in metering or relaying applications. Your Westinghouse representative will help you select the right Instrument Transformer for your problem. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70652

YOU CAN BE SURE...IF IT'S
Westinghouse
INSTRUMENT TRANSFORMERS

Again in Southern California it's

Exide-Manchex

BATTERIES

This modern 16,000- to 40,000-volt substation serves one of the busiest and most closely built-up areas of the Golden State. The station is the Duplex type employing outdoor metal-clad switchgear. Control power is provided by dependable Exide-Manchex batteries which assure:

POSITIVE OPERATION: Dependable performance at ample voltage with no switchgear failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding.

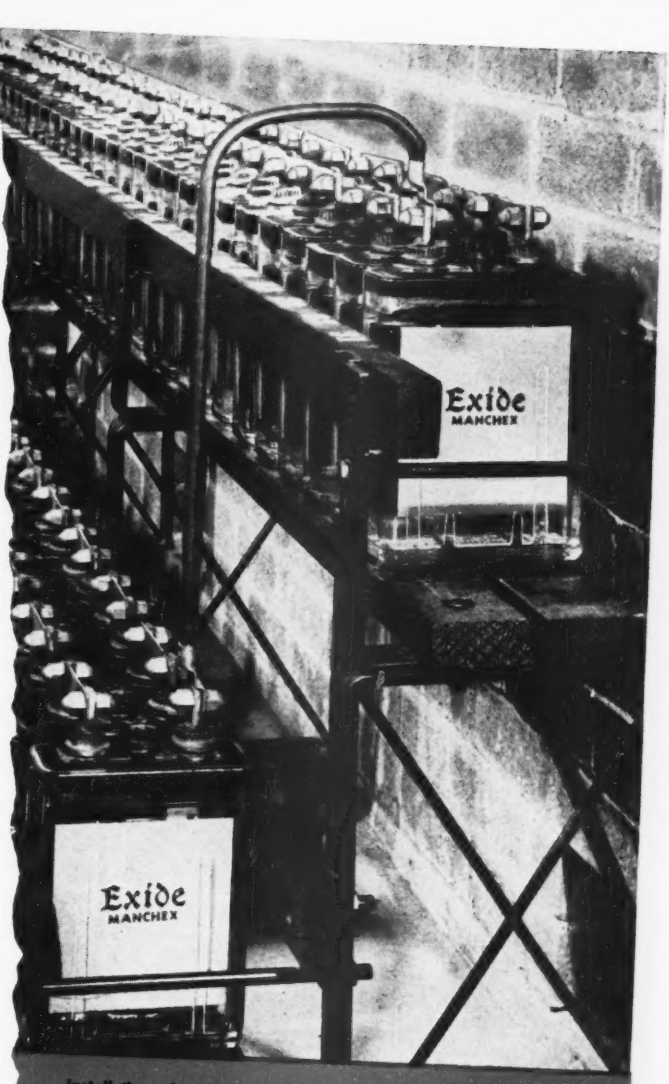
• • •

Various sizes and types of Exide Batteries are available in plastic containers.

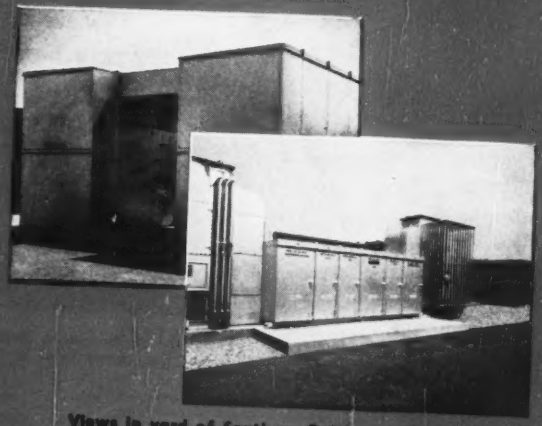
Exide-Manchex is your best battery buy for all control and substation services.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" *Reg. T.M. U.S. Pat. Off.*

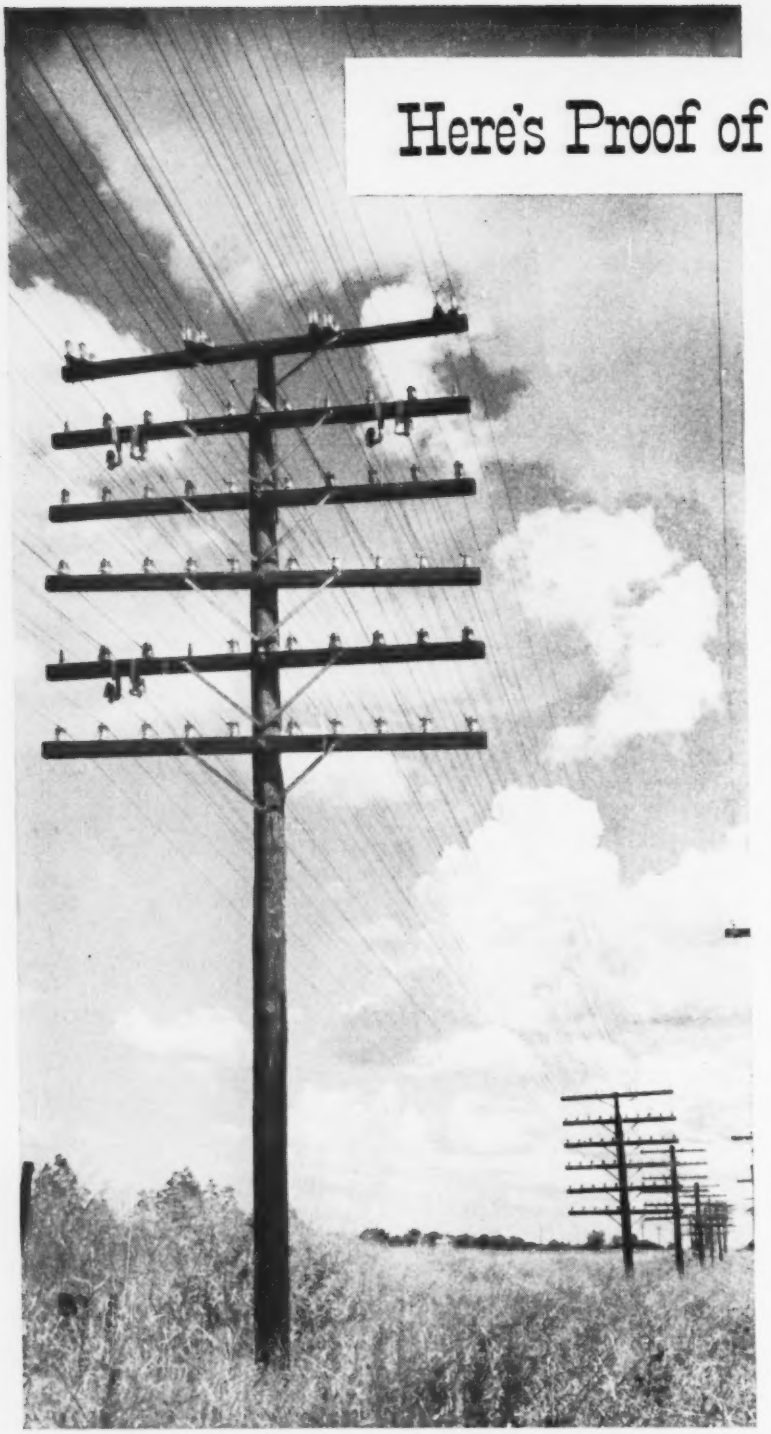


Installation of 60-cell DME-5A Exide-Manchex battery mounted on two-level rack built to withstand earthquakes.



Views in yard of Southern California utility company showing metal-clad switchgear equipment operated by Exide-Manchex batteries.

1888...DEPENDABLE BATTERIES FOR 65 YEARS...1953



Here's Proof of Performance...

Southwestern Bell has had 40 years of service from these pressure-creosoted poles

● In 1912, Southwestern Bell Telephone Company erected these poles to carry a toll line from Dallas to Ennis, Tex., as one link in a through route from Houston to Dallas. A total of 1240 poles were erected in the 31-mile section and each was pressure-treated with Creosote Oil at 6 pounds retention.

Today—40 years later—more than 42% of the original poles are still in service. Most of the replacements took place in 1948 when the line was given a major overhaul. The poles left in place at that time were sound, showed no signs of rot or splitting, and appeared good for 5 to 10 years of additional life.

When you use a wood preservative, let service records like this be your guide. They are another good reason why users of preserved wood make Creosote Oil their first choice.

Creosote Oil contains not one but many compounds whose toxicity and permanence ward off attack by such wood destroyers as termites, fungi, dry rot and marine borers.

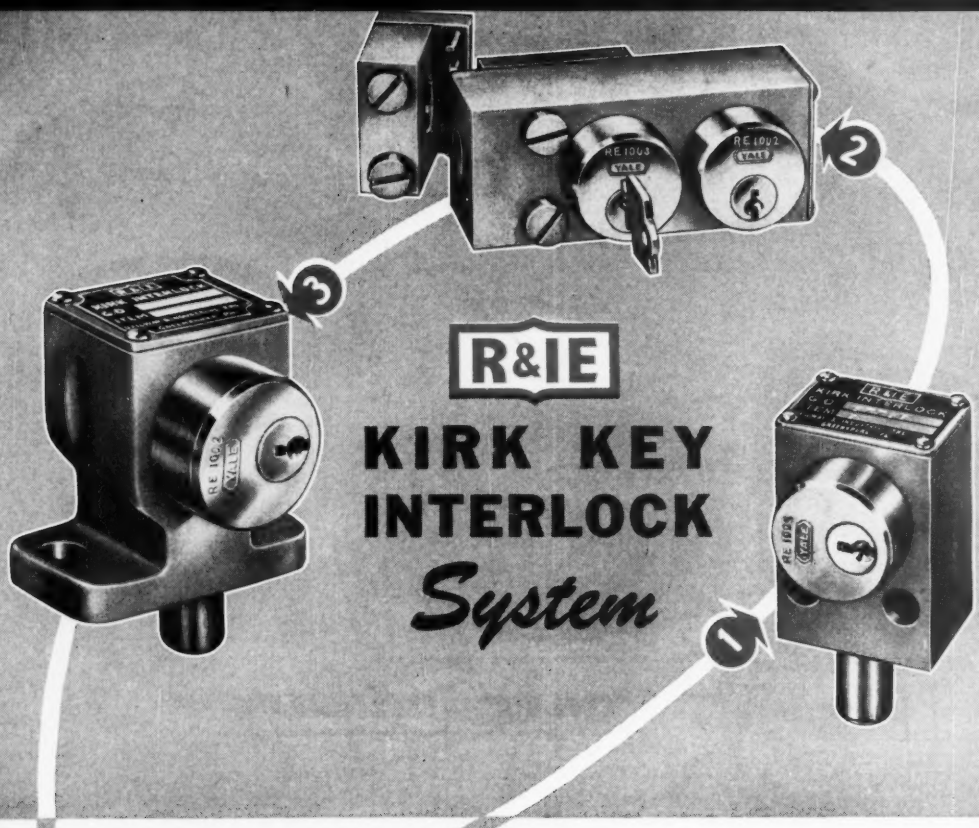
When you use treated wood, be sure it is pressure-creosoted with U·S·S Creosote Oil. It is the product of continuous processing in the world's biggest tar distillation plant. For complete information, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

THESE PRESSURE-CREOSOTED POLES, owned by Southwestern Bell and located near Highway 75 between Dallas and Houston, Tex., have been in service since 1912.

U·S·S CREOSOTE OIL

3-13

UNITED STATES STEEL



R&IE KIRK KEY INTERLOCK *System*

KEY . . . YOUR OPERATIONS FOR SAFETY

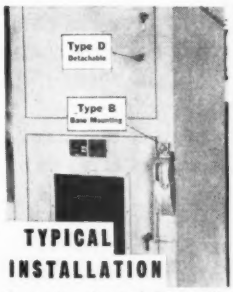
Kirk Key Interlock Systems prevent the authorized person from doing the unauthorized thing! Added safety for your installation and equipment is provided by this device which is applied to two or more movable parts, preventing or allowing movement of one part only when another part is locked in a predetermined position. Unlimited operating schemes can be arranged in electrical installations, processing systems, fluid and pneumatic systems, etc., from combinations as shown, or multiple units of any one of them. Individual locks are mechanical and meet basic mounting requirements. Following are descriptions of the 3 types shown above:

1. **TYPE F**—For flat mounting—Can be mounted on any protective device.

2. **TYPE D**—Detachable....Can be mounted on cell door, gate or compartment. One key retained with door locked open....other key can be retained by operator or used to operate other devices.

3. **TYPE B**—For base mounting—Can be mounted on handle of disconnecting device....Key released when lock is open.

Please write for Bulletin No. 1725 for full description, applications and typical schemes for R&IE Kirk Key Interlocks



TYPICAL INSTALLATION

Shown above is a typical installation of a Kirk Key Interlock System. Fuse compartment can only be opened when interrupter switch is locked open.

R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

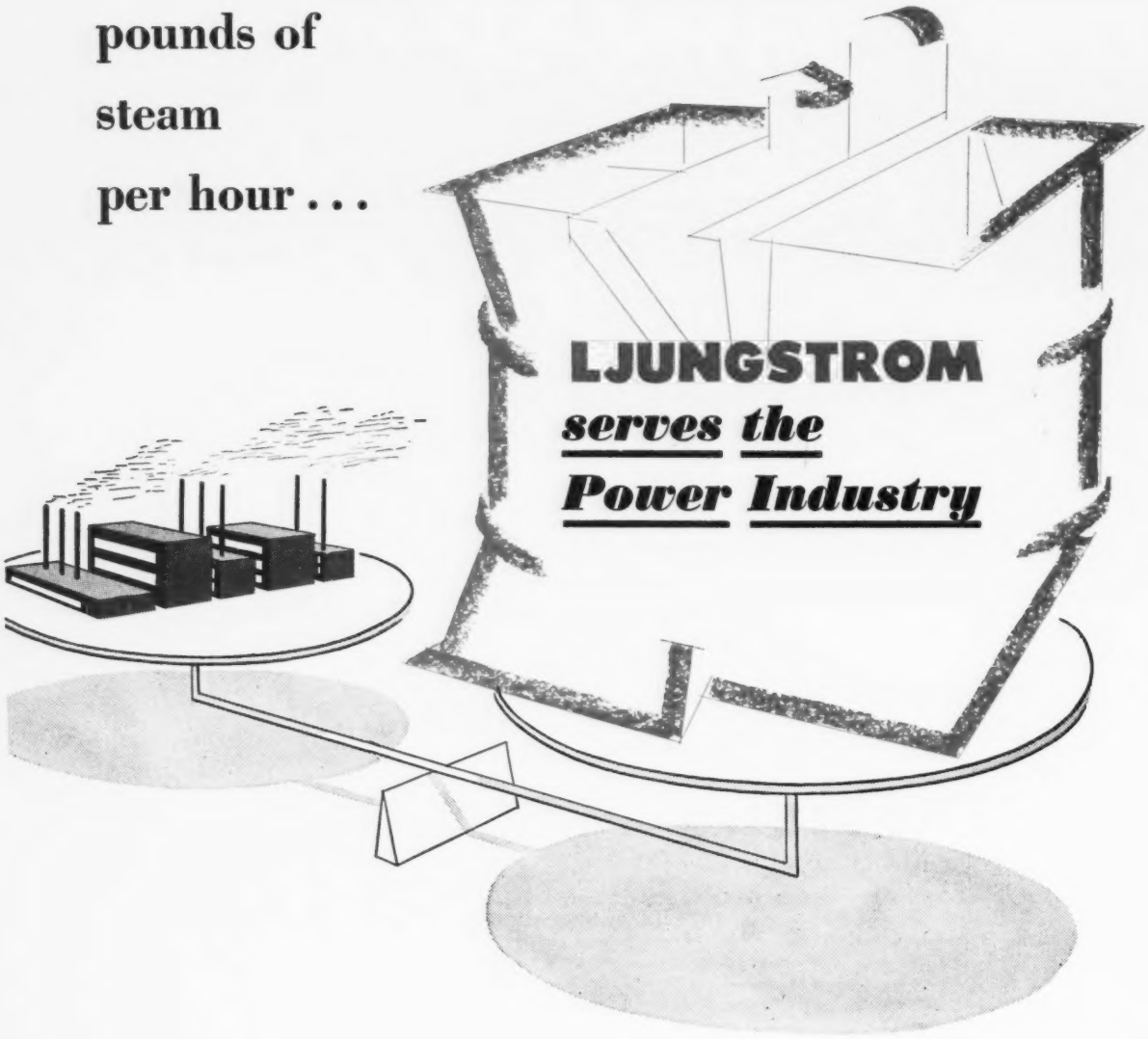
AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

347,000,000

pounds of steam per hour . . .



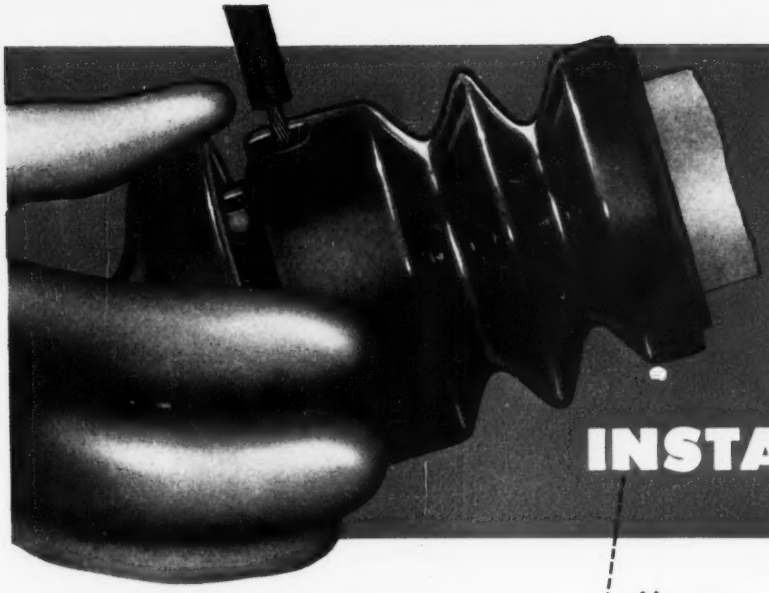
In the post-war rush to expand power generating facilities, utilities have not lost sight of the need for *operating economy*. Increasingly over these years, the fuel-saving, performance-improving potentials of the Ljungstrom Air Preheater have been realized – until today, nearly two out of every three power boilers are ordered with the specification "Ljungstom Air Preheater."

Since 1946 alone, in fact, more than 347,000,000 pounds per hour of steam capacity – installed or on order – have been designed for Ljungstrom.

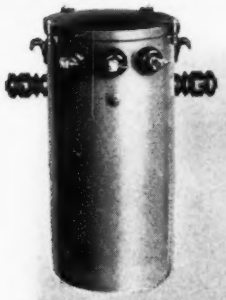
This record speaks for itself. It proves that the Ljungstrom Air Preheater is, indeed, *the most efficient heating surface in the modern boiler.*

The AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

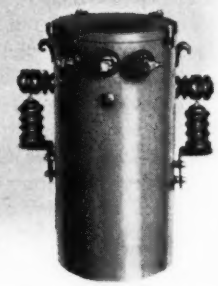


FOR SAFE, EASY, FAST INSTALLATIONS



Type A, OISC conventional distribution transformer, 15 KVA, single-phase, 60-cycle, with side wall mounted high voltage bushings. Standard construction for voltages 5 KV and less, and sizes through 100 KVA.

DISTRIBUTION TRANSFORMERS



Type CSP, OISC distribution transformer, 15 KVA, single-phase, 60-cycle, with primary lightning arresters, internal fuses, low voltage circuit breaker and side wall mounted high voltage bushings. Standard construction for voltages 5 KV and less and sizes through 100 KVA.

You make primary line connections the new, improved way on STANDARD'S 2400 or 4800 volt Distribution Transformers. Working closely with operating men in the field, The Standard Transformer Company developed time-saving Tank Wall Bushings which permit flick-of-the-wrist installations . . . without tools. No "live parts" exposed . . . terminal compression stud keeps easy-to-grip, insulated porcelain cap from falling off when unscrewed to receive primary lines. Cable can be brought in from either side and held securely by pressure from clamping shoe.

Perfected side mounted bushings, plus additional sound basic construction features, make STANDARD'S 2400 or 4800 volt Transformer one of the best buys on the market today. When you specify STANDARD you get a transformer with easily-removed covers, moisture-proofed with a Neoprene gasket which prevents oil leakage; a low-loss core assembly housed in a rugged, all-weather, copper-bearing steel tank; a core assembly made of non-aging, varnish-coated, silicon steel sheets. These features mean a long-lived, trouble-free transformer . . . silently, efficiently working for you.

Write for specific information on new Tank Wall Bushings.

Everything Points To...

Standard

Trade Mark ®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

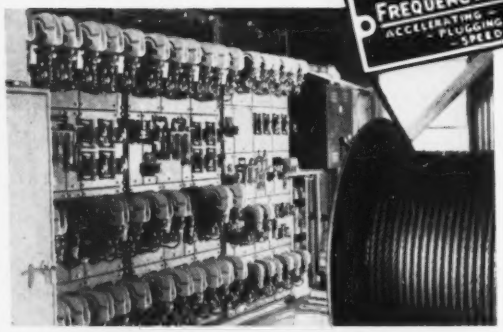
REPRESENTATIVES IN PRINCIPAL CITIES

WRITE FOR BULLETIN CL-50

Tells the story with words and pictures of STANDARD'S complete line of transformers, and how they perform for every class of service . . . on the job.

Fast Lifts–Safe Lifts WITH EC&M CONTROL easy to operate, TOO

Narrow-width EC&M Cam Master Switches are closely grouped for operator's convenience on this 720 ton-per-hour Barge Unloader, designed, fabricated and erected by Heyl & Patterson for the Duquesne Slag Company, Pittsburgh, Pa.



EC&M LINE-ARC Contactor Controllers for Closing & Holding Line Motors and for the Trolley Motion are EC&M Frequency Relay Controlled for fast, safe operation.

Output increases and costs go down when operators find rhythmic response at their finger-tips. Paying out cable to dig into the pile, taking the swing out of a loaded bucket at the point of discharge, and keeping the bucket open when lowering for another load are time-savers on bulk material-handling applications.

On river unloading stations, at lake and ocean ports, EC&M Control has a reputation among operating management for fast handling because bucket manipulation, trolley travel and similar operations respond quickly to the operator's needs. Straight-line, lever-operated EC&M Cam Master Switches have a short throw in both directions—are less tiring on the operator—the off-point is distinct and easy to find when returning from any of the speed-points. Put your control applications up to EC&M.

It pays to specify **EC&M Control—control engineered for high output with safety.**

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Introducing

The EMT thin wall conduit

with the SPANGLEAM finish

...at no extra cost!

SPANGLEAM —an all new product, inside and outside!

Inside: Wire pulling easier than ever with the new smoother, protective coating of resinous lacquer compounded with Zirconium. Corrosion resistance *plus* assured grounding.

Outside: Electrogalvanized exterior specially processed for this smart, new finish. Where conduit must be installed in exposed locations, SPANGLEAM presents a neat, attractive appearance. SPANGLEAM is highly resistant to smudge, abrasion and corrosion.

SPANGLEAM —tops in the field!

- easier to cut
- easier to bend
- faster to install
- cleaner
- lightweight
- strong
- permanent

SPANGLEAM —available immediately in the full range of six sizes:

½", ¾", 1", 1¼", 1½", and 2" O.D.

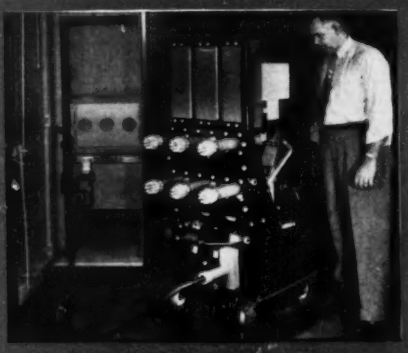
Find out how SPANGLEAM can help you—

- give you a better installation
- make your work easier
- build profits

See your distributor . . . he has SPANGLEAM *in stock.*

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
PITTSBURGH 30, PA.
District Offices and Sales Representatives in Principal Cities



Test jumper facilitates breaker inspection, operation and maintenance at the station site.

Hard-to-get-at undersurfaces are protected against rust and corrosion by a heavy-rubberized sealing material.

Install Switchgear Outdoors

GET CONVENIENT OPERATION PLUS COMPLETE PROTECTION

When building-cost considerations suggest outdoor switchgear installations, you'll naturally want equipment that can be most conveniently operated and maintained in the open . . . and weatherproofed to protect against rust and corrosion. Westinghouse Outdoor Metal-Clad Switchgear meets these specifications.

Convenient Operation and Maintenance — Easily operated horizontal drawout circuit breakers eliminate lifting and lowering. A few turns of a crank connect or disconnect the breaker. Breakers of like rating are interchangeable and are easily rolled on the adjustable-height transport truck with its combination latching device for breaker and stationary structure.

Weatherproof Construction—Utilizing rigid, self-supporting, jig-welded construction features, Westinghouse Outdoor Metal-Clad Switchgear is equipped with a weatherproof housing, special underframe or base, and access doors at both front and rear of the unit. Space heaters and special ventilators in each unit reduce the possibility of condensation. As long-term protection against rust and corrosive elements, the metal frame is Bonderized, prime and finish painted, and the base receives a heavy spray application of all-weather undersurface coating.

For complete facts on outdoor or indoor metal-clad switchgear, write for Booklet 5306. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60793

YOU CAN BE SURE...IF IT'S Westinghouse

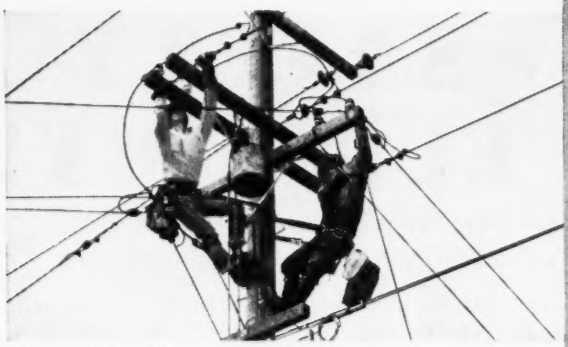
DESIGN TESTED AND VERIFIED in the Westinghouse HIGH POWER LABORATORY

METAL-CLAD SWITCHGEAR

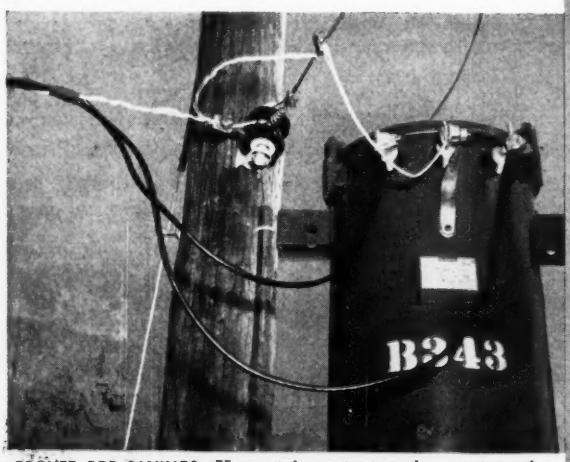
MAKE IT GOOD

WITH ALUMINUM CONDUCTOR

PROVED FOR SERVICE—Rapidly increasing usage of aluminum conductor for service drops, secondary and transmission lines is proof of its industry-wide acceptance. Proof that aluminum conductor is doing a good job under widely varied conditions.



PROVED FOR CONVENIENCE—Aluminum conductor's natural advantage of light weight makes it the first choice of many linemen. Aluminum strings faster, easier—saves installation time and money.



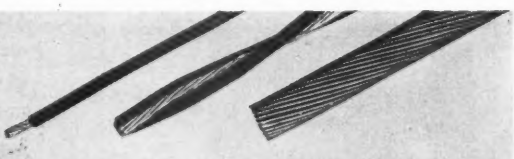
PROVED FOR SAVINGS—You get important savings *automatically* when you specify aluminum conductor. The initial cost of aluminum is far less than with copper. And easier handling is possible because of aluminum's light weight.

MAKE IT BETTER

WITH KAISER ALUMINUM CONDUCTOR

FIELD SERVICE—Kaiser Aluminum field men have a growing reputation for helping make better installations at lower cost. They pitch in and help on a job, use their long experience to devise cost-cutting techniques. They closely watch schedules to insure on-time delivery of Kaiser Aluminum conductor.

ENGINEERING AND LABORATORY SERVICE—Specialists from Kaiser Aluminum Engineering Service are available for meetings with supervisors and crews—often resulting in worthwhile savings, improved installations. Sag and tension charts are provided where necessary. Research problems are carefully studied by Kaiser Aluminum Laboratory Service—one of the best-staffed and best-equipped in the industry.



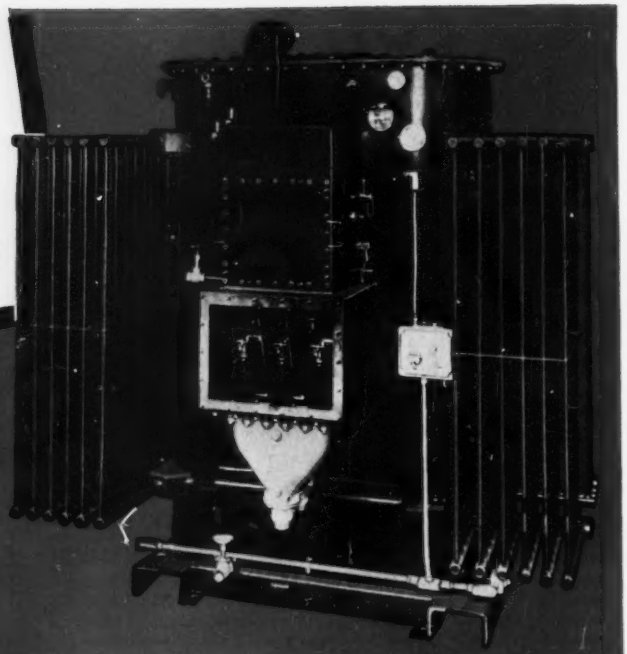
THIS COMPLETE SERVICE is available to you at no obligation when you specify Kaiser Aluminum conductor. *Act now!* Request free pamphlet giving complete engineering data on new Kaiser Aluminum covered conductor—both weatherproof line wire and self-supporting Triplex cable for service drops and secondary distribution lines. Contact any Kaiser Aluminum office in principal cities, or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc., Oakland 12, California.

Kaiser Aluminum

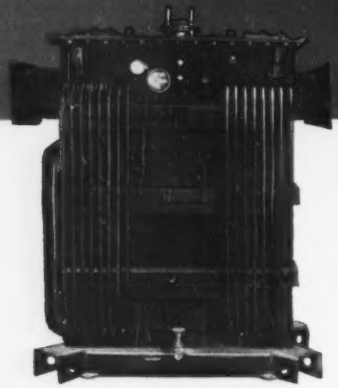
setting the pace—in growth, quality and service

Neoprene and Polyethylene Covered Conductor, Solid and Stranded Self-supporting Triplex Cable • ACSR • All Aluminum Conductor

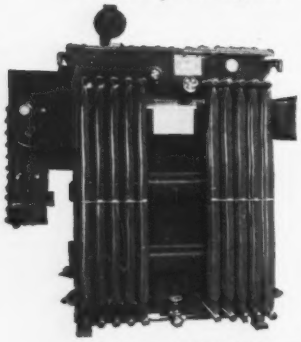
MOLONEY *Askarel* TRANSFORMERS



1500 Kva 13200-2400 volt Askarel Transformer with HV selector type disconnect switch and terminal chamber equipped with two sets of cable connections to provide a preferred and emergency feeder to the transformer.



500 Kva 4800-240 volt, three-phase, sixty cycle, Askarel Load Center Transformer with throats for connection to primary and secondary switchgear.



500 Kva 4160Y-240 volt, three-phase, Moloney Askarel Transformer

for SAFETY and ECONOMY!

Where Non-inflammable Transformers are required—either Indoors or Outdoors

Because Moloney Askarel Transformers are cooled and insulated with Askarel, a non-inflammable liquid, they are suited to use in applications where oil-cooled transformers would be hazardous to life and property.

Askarel Transformers are ideal for indoor installations. However, their weatherproof construction permits outdoor installations such as in mines, on roofs, in street and sidewalk vaults for a-c network systems, etc.

Askarel Transformers effect savings in installation costs because expensive fireproof vaults are not necessary. Because the transformer can be located at the center of the electrical load, expensive runs of secondary copper are eliminated. This also provides improved voltage regulation.

MEB2-26

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Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Solving Atomic Power Problems—II

Changes in the Atomic Energy Act are needed to open the way for the rapid solution of atomic power problems. Today most thoughtful people, within and without government, feel that this move is essential.

Utilities and associated industrial organizations must have the right to design, construct, own, and operate reactors and related equipment necessary for the application of atomic energy for power production. This will give them the opportunity to solve the remaining technical, economic, and legal problems involved.

There are many difficulties standing in the way of adequate changes in the Atomic Energy Act. One of the main ones is the matter of overcoming attitudes of some members of Congress.

The Senate Committee Report which recommended the Atomic Energy Commission idea in 1946 had this to say, "The committee has been convinced that an absolute government monopoly of production of fissionable materials is indispensable to effective domestic control of atomic energy." At the time the law was drafted, few people could begin to comprehend the staggering consequences of the new scientific development. Such exaggerated positions as that taken by the Senate Committee are completely understandable. But today many of the fears existing before have been dissipated.

AEC Chairman Gordon Dean has taken the position that the government must relinquish at least part of its monoply if peaceful uses of atomic energy are to be brought to full flower. It is believed that this view is held by most of the members of the commission. Outside of this important group, many others in persuasive positions are taking steps to promote action.

Utility representatives have been in session with the AEC preparatory to conferences with Congress. The National Security Resources Board has indicated its approval of the idea of permitting privately owned electric utilities and other firms greater latitude in developing improved methods for generating electricity from nuclear power sources. EEI has organized a committee to work on problems in this field and coordinate the industry's activities.

Evidences of a changing attitude are prevalent everywhere. The final determination of the direction in which atomic power development will go rests upon the Congress. But strong electrical industry backing for a realistic change in the Atomic Energy Act is essential.

We must eventually have changes in the law to permit private industry to design, construct, own, and operate atomic power facilities. It is not expected that adequate private capital could be attracted on any other basis.

Six Targets Worth Hitting

One of the industry's "Big 4" has announced its objectives for 1953. The Electric Companies Public Information Program will direct its activities toward:

1. Supplying background information to support those who wish to restore free enterprise development and operation of electric power in those areas which have been dominated by the federal government and to extend the benefits of enterprise development to every possible phase of economic activity.

2. Helping the American people, by full utilization of PIP channels, to understand the importance to them and to the nation of dependable electric service under this enterprise development so that they might make a free choice between private industry development and any further attempts at nationalization.

3. Obtaining widest possible publicity, consistent with national security, for the contributions of the electric and other industries in developing commercial applications of atomic energy and in providing necessary power for that development—to the end that the public will understand that such development should be done to the greatest feasible extent by private capital, not by government.

4. Demonstrating through PIP channels that the electric companies, individually as well as collectively, are willing and able to meet the full needs for electric power in or contiguous to areas they serve.

5. Developing public understanding of the inequitable conditions created by application of the preference clause.

6. Creating public opinion favorable to adaption of an equitable federal power policy.

It would be hard to understand how any believer in free enterprise could find fault with these objectives. They are basic to the well being of all companies and are worthy of support by all companies. At present PIP is just aiming at these targets. How well it hits them depends upon how well the companies supply guns and ammunition.

Half-a-Man per Megawatt

Three or four years ago the average larger power plant was functioning with about one man on the payroll for each megawatt of generating capacity. That man is now being halved for the newer plants. The question is not so much whether that remaining half-man will sooner or later be dispensed with thus giving steam generation equal push-button status with the automatic hydros. It is rather whether the managements realize that halving a plant's staff puts double responsibility on the half that is given the job of running the plant.

Particularly indictative is any tendency of executives to feel that plants are so fully automatized that the few men who work there have comparatively little to do or that those few can walk into a new plant, take a look around, and start pushing buttons. Operators of these new plants still need training even if they come from older plants where they may have worked for years.

Seniority often plays a hand in these transfers. In this case the way to pick the men for the radically different responsibilities in the new plants is to try them out in training. In this way those who "can't take it" will be weeded out. And training in the plant itself (or one like it, even if on another system) is what makes it safe to run a modern plant with half-a-man per megawatt.

Air Douses Oil Fires

Strangely enough air—despite the oxygen content that supports combustion—is being used effectively to extinguish or limit oil fires. The air is bubbled up through the oil so as to agitate the lower and cooler portions so they will be moved to the burning surface. The result is a chilling which reduces the surface conversion to vapors which really do the burning. Complete effectiveness is reported obtainable from air agitation of oils that have flash points higher than their storage temperature. For oils with lower flash points agitation slows the combustion for easier extinguishment by other means that smother or chill the burning vapors.

Socony-Vacuum tests in Paulsboro, N. J. on Nov. 18 showed crude oil flames brought under control under 2 minutes using air, nitrogen, or carbon dioxide. Kerosene fires were put out in just 5 seconds. The air-agitation method looks like a meritorious supplement to prevailing methods applicable to stored oil if only to conserve the extinguishing agents they require.

Air Preheater Troubles

That there have been troubles with corrosion and plugging of air preheaters is no secret, certainly not since these difficulties were aired and the remedies pointed out at the recent ASME sessions. Several factors were recognized as the culprits. One was the trend toward lower gas exit temperatures, another the increasing content of sulfur in the fuels, and still another the lower ambient temperature that attend locating the air preheater outdoors. All three conspire to accentuate "dewpoint" deposition of moisture and its consequent union with sulfur dioxide or sulfur trioxide to start the corrosion.

Most of the remedies aim at raising the temperature of the metal involved in the heat exchange between the gases and the air being warmed by them. It appears now that the prevailing assumption that the metal temperature is the average of the gas and air temperatures is unsound—actually it has been found to be as much as 80 degrees lower than that average. Combination of parallel flow and counterflow has been advocated as a means of improving the metal temperature in the preheater.

In some cases plugging or corrosion of the tubes has necessitated repairs which virtually dictated the duration of the outage for unit overhaul. That is a charge that such an accessory can ill afford to bear even though it does contribute nicely to plant economy.

There is manifestly more to the air preheater than has been recognized. One way to correct this situation is to watch the temperatures of gas, metal, and air to know when the combination approaches the trouble zone. That is particularly true when switching from coal of low sulfur to oil of high sulfur or vice versa. In fact, it may well be that preheaters deserve the same kind of instrumentation and alarms that have been provided for some of the other power plant elements.

THE ELECTRICAL WEEK

The Issue's News Highlights—U. S. Court of Appeals, in Niagara Mohawk case, decides that a state's water rights do not "evaporate" within the area covered by a FPC license. Corollary: Commission can issue a license only if applicant has right under state law to divert water for project . . . Senator Wiley (Republican of Wisconsin) proposes a bill that would have the federal government participate in St. Lawrence Seaway but not the power project.

Two Kansans—Jeff A. Robertson, chairman of state's Corporation Commission, and Richard B. McEntire, member of Securities and Exchange Commission—have inside track to be chairman of FPC and SEC respectively.

Off the Washington Wire—Convening of Republican Congress brought few bills dealing directly with power matters. Among those introduced were one which would authorize construction of Trinity River project in California and several relating to U. S. participation in construction of St. Lawrence Seaway.

Interior Secretary-designate Douglas McKay conferred with present secretary, Oscar Chapman, and several Congressmen in Washington last week. He will meet this week with President-elect Eisenhower and other members of his staff in New York . . . R. P. Parry, Twin Falls, Idaho, lawyer, is being considered for a post in Interior Department. No final decision had been made last week. Parry represented Idaho Power Co at hearings on Hells Canyon last year.

Depa has anounced minor requirement allotments for first two quarters of this year and advanced allotments for third and fourth quarter . . . Reclamation Bureau has cut wholesale power rates in North River Valley of Nebraska and Wyoming by 25 to 30%.

Warrior River Electric Cooperative Association has received a preliminary FPC permit to investigate site for proposed hydro-electric project on Warrior River in Alabama.

From New England—Adverse water conditions in 11 months of 1952 increased operating costs of Central Maine Power's fuel burning plants by $1,079,541, or 62% over a year ago. Additional energy sales to industrial customers also short of water power, and increased fuel cost adjustment, helped in part to offset this higher generating expense, says W. F. Wyman, CMP president. Company is seeking a 14% rate increase, which would produce $3.25 million per year in revenue . . . In a letter to stockholders, New England Electric System's Pres Irwin L. Moore estimates earnings at about $1.20 per share on 7,901,000 average number of shares outstanding in 1952 as compared with $1.31 a share on 7,364,583 shares in 1951.

From East North Central—Miamisburg, Ohio, City Council asks Ohio PUC to appraise municipal electric plant, while Dayton accounting firm is studying the plant earnings over last ten years. Officials are seeking to sell the plant to Dayton P&L.

From West South Central—Yorktown, Tex., City Council grants new 30-year franchise to Central P&L . . . Missouri Utilities asks Arkansas PSC approval to sell its properties in Greene County to Arkansas-Missouri Power for $50,000 plus a $15,000 commission to T. J. Raney & Sons, Little Rock bond brokers who handled recent sale by Missouri Utilities of the Paragould property to Ark-Mo . . . Arkansas-Missouri Power has announced completion of purchase of all common stock of Associated Natural Gas Co of Sikeston, Mo., for about $900,000. Ark-Mo will ask Missouri PSC approval.

From the Far West—For a fifth week running, Depa announced Jan. 2 it would not consider further load curtailment in Pacific Northwest power pool for another week. But as new critical weeks loomed in late January-February there was question that Depa and private and public utilities could avoid some form of additional, if only very temporary, mandatory cuts in industrial deliveries.

Financial—Morgan Stanley & Co group wins bid by naming a total compensation of $108,924, 22,699¢ a share, for underwriting an offering of 479,846 additional shares of common stock to common stockholders of Ohio Edison Co at $35.25 a share (see page 78) . . . Consolidated Edison Co of New York will sell competitively around Feb. 17 $40 million of first mortgage bonds.

Public Relations and Advertising—A slide-sound presentation of "The Basic Reddy Kilowatt Story," by Ash Collins has just been sent all companies taking Reddy Kilowatt service. Presentation tells of development of the service and how it can be used . . . Raymond C. Baker and Paul E. Morgan became partners in Stephen Fitzgerald & Co, public relations counsel for National Association of Electric Companies.

In a report to the Committee on Public Works covering "The Allocation of Federal Water Resource Development Projects" a subcommittee to study civil works said: "Frequently items are not included. In particular, amounts for taxes or in lieu of taxes an amount for interest during construction are frequently omitted. The subcommittee is of the opinion that all agencies should include the same elements of cost in their studies and calculations."

Congratulations—Arthur L. Patterson, chief engineer of Shawiningan Engineering Co, is appointed vice president. Company names Guy Rinfret chief engineer . . . Oklahoma Utilities Association names as its president W. R. Wolfe, vice president of Oklahoma G&E . . . Potomac Electric Power appoints Lucius E. Steer, Jr. electrical engineer . . . Wade B. Stringham is elected commercial vice president of GE . . . New York State E&G names David A. Lewis vice president in charge of general operations . . . Pennsylvania Gov John S. Fine appoints Leon Schwartz, of Nanticoke, chairman of PUC. He also names P. Stephen Stahlnecker, of Philadelphia, and Thomas C. Egan, Philadelphia attorney, to PUC . . . California Oregon Power elects Frank C. Bash as vice president and treasurer, succeeding Morey D. Field.

Decision in Niagara Mohawk case makes these changes in the older concept of Federal Power Commission authority:

- **A state's water-use rights do not "evaporate" within the area of a federally licensed hydro project**
- **Commission can issue a license only if applicant has right under state law to divert water for proposed development**

John W. Davis wins another one as . . .

Court Cuts FPC's Licensing Powers

State water-use rights do not "evaporate" when encompassed in a federally licensed hydroelectric project. On the contrary, they may remain both valid and compensable.

This is the gist of a 2-1 decision handed down Dec. 31 by the U. S. Court of Appeals for the District of Columbia Circuit in a case involving Niagara Mohawk Power Corp. The court majority further said that Federal Power Commission can lawfully issue a water power license only if the applicant has the right under state law to divert water needed for the proposed development.

For attorney John W. Davis, who argued the case for Niagara Mohawk, the court's decision added another win to an already successful year. The one-time Democratic Presidental candidate, scored last summer when he upset government seizure of the steel plants with a dramatic argument before the Supreme Court. He also presented the arguments for states' rights in the recent segregation cases before the high court.

If allowed to stand, the decision will amount to sweeping set-back for federal regulation of navigable streams, according to FPC attorneys. Assistant General Counsel Willard W. Gatchell, who argued the case before the court in November 1951, said then that such a view would have the effect of a "state veto" over water power development.

The decision would appear to give state bodies at least equal authority with FPC in determining who shall develop potential waterpower sites on navigable streams. It knocks a gaping hole in FPC's contention that it has "full control" over licensing water power development on all navigable streams in the nation.

Outcome of the case was a thumping victory for Niagara Mohawk. But the opinion appeared to go much further in whittling away FPC authority than the utility had asked. The court fight had been pitched on a more narrow basis—whether the company had erred in paying for certain state-granted, water-use rights.

I. How the Dispute Grew

The dispute grew out of a 1950 FPC order which directed Niagara Mohawk to exclude certain payments it had made for water use rights in figuring its amortization reserve account. The commission contended these water rights "evaporated" when the company received its federal power license in 1921, and hence no compensation was required.

Effect of the FPC order would have added $399,000 to the company's amortization reserve account.

The appeals court decision does not deny the long-accepted proposition that Congress may exercise absolute power over the improvement of navigable streams. It does hold, however, that such authority was not necessarily exercised in the Federal Power Act under which FPC operates.

Written by Federal Judges Kimbrough Stone and Wilbur K. Miller, the majority opinion concludes:

- The disputed water-use rights are valid property rights under the law of New York.
- "The Water Power Act of 1920 (now Part I of the Federal Power Act) did not extinguish the rights but simply forbade their use without a federal license."
- "Such a license is not the source of water rights but a permission to exercise usufructuary rights acquired pursuant to state law."
- ". . . Payments made by the petitioner under its contractual obligations as lessee of the water rights are proper operating expenses."

The court thus found that FPC had erred in disallowing payments for the rights and in increasing on that account Niagara Mohawk's amortization reserve liability. FPC was directed to modify it's 1950 order in accordance with the views of the court.

II. The Dissent

In a brief dissenting opinion, Judge David L. Bazelon held that the Federal Power Act "does assert the preemptive right of the United States in the exercise of its power to regulate commerce and does not save the private rights in question."

He wrote that the act "is an assertion of the commerce power which constitutes a taking by the United States without compensation of all water rights affecting navigable streams except to the extent and in the

manner that the act expressly saves certain rights created under state law."

Such rights, he added, include use of water for irrigation, municipal purposes or other purposes of the same nature. Water rights claimed in the case were superceded by the Federal Power Act, Bazelon concluded.

By comparison, the court majority took a much more limited view of the authority conferred upon FPC by the Federal Power Act.

"The act," said the majority, "is purely a regulatory measure. A federal license is not an original grant of authority, but a permission to use a state's grant of authority."

An applicant must show the commission he has under state law the right to divert the water required for the proposed project, the majority said.

"Unless he has that right, we think the commission cannot lawfully issue a license to him."

Unless reversed, the decision would appear to cast doubt on the validity of FPC licenses granted for the Cowlitz Project in Washington and the Pelton Project in Oregon. State bodies in both cases have argued that the licenses were contrary to state laws designed to protect fish in the two rivers. The question now arises as to whether City of Tacoma in the Cowlitz case or Portland General Electric Co in the Pelton case have acquired state water-use rights sufficient to make them eligible for the federal power licenses they now hold.

Iowa Utility and Co-op Sign Interchange Pact

Iowa Electric Light & Power Co and Corn Belt Power Cooperative recently signed a contract providing for interchange of 15,000 kw between the two systems.

IEL&P serves 93,000 power customers in central and northern Iowa, Corn Belt composed of 12 REA member cooperatives, serves 30,000 farms in the north-central portion of the state.

The agreement provides that IEL&P build a high-voltage transmission line from Marshalltown to Conrad. The cooperative will install telemetering and supervisory control equipment for regulating exchange of power between its 69-kv system and the 115-kv system of the utility.

Seaway Without Power Dam...

. . . is proposed by Senator Wiley to win approval for federal participation. Hearings resume before FPC on hydro project

Congress will have one more chance to consider limited U. S. participation in building the long-debated St. Lawrence Seaway Project.

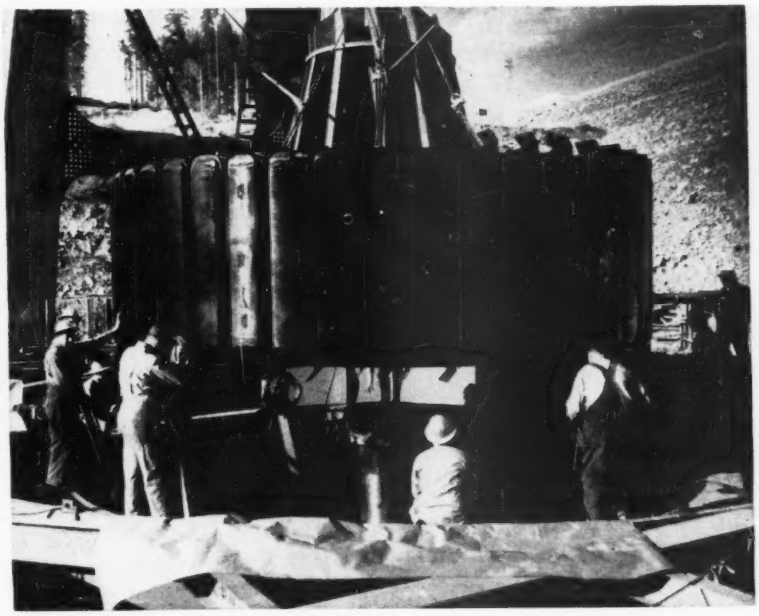
Latest plan would permit the federal government to join with Canada in building a deep-draft channel in the International Rapids section of the river. Under this proposal, the 1.8 million-kw power project would be built separately by the Province of Ontario and New York State.

Ontario All Set . . . Ontario already has authority needed to begin construction of the Canadian portion of the hydroelectric project. An application is pending before Federal Power Commission for a federal license authorizing the Power Authority for the State of New York to construct the U. S. portion.

Author of the latest plan to permit federal participation in construction of the waterway is Republican Sen Alexander Wiley of Wisconsin, a vigorous proponent of the channel which would open the Great Lakes to ocean-going vessels. As top Republican on the Senate Foreign Relations Committee, he is in a position to speed his bill toward a vote on the Senate floor.

More Appeal? . . . Without the controversial power project, federal participation in the waterway construction may have more appeal to Congress than in the past. In various forms, bills providing for joint U. S.-Canadian construction of the seaway and power project have failed to win Congressional approval. Canada announced last year it would construct the entire channel without U. S. help provided the way was cleared for construction of the power project. The power project would include a dam which is a vital part of the waterway plan.

Wiley's bill would provide for creation of a development corporation to



Rotor Lowered at Yale Project

Rotor assembly installation at Pacific Power & Light Co's $30-million Yale project on the Lewis River in southwest Washington took place in November and December last year. The project's two 54,000-kw units are now delivering power to the Pacific Northwest Power Pool. First unit began producing power in December and the second as the New Year got under way.

build that part of the seaway channel on the U. S. side of the International Rapids. The corporation would keep hands off the power operations, but would share in tolls assessed on vessels using the seaway. It would be financed by issuance of self-liquidating bonds.

U. S. money involved would be less than $100 million, compared with $566 million expenditure proposed in previous seaway bills, Wiley said.

Spalinski's Application . . . A second application for a federal license to build and operate the U. S. portion of the St. Lawrence power project is before the commission. The applicant is Public Power & Water Corp of Trenton, N. J. An FPC hearing on financial ability of the Trenton concern is scheduled for today (Jan. 12). The commission turned down a motion that this testimony be taken in the form of a deposition from Dudley G. Luce, president of J. G. White & Co, New York investment banking firm.

Hugo A. Spalinski, president of the Trenton concern, had filed the motion for the deposition, but this was turned down in favor of a hearing in Washington. Another hearing on the Spalinski application is also set for Feb. 2.

Power Promoter . . . Spalinski has been promoting vast water and power projects for 20 years. Nothing has come of his efforts.

The German-educated mechanical engineer organized Electric Power Co of New Jersey in 1933. In 1946 the firm submitted plans to the State Water Policy and Supply Council for the construction of three dams on the upper Delaware River to cost $195 million.

The council opposed the plan on the grounds that the Delaware should be conserved primarily for water supply to New Jersey, Pennsylvania and New York and that its development should be carried out by an interstate agency. When Spalinski went to FPC for a license the council filed a formal objection to the plan. New Jersey's attorney general told FPC that Electric Power was not equipped financially to carry out the project.

The application remained before FPC for four years but the commission never gave Spalinski permission to construct the project.

In 1948 Electric Power was reorganized as Public Power & Water Corp with the same purpose of the earlier company. Authorized capitalization is 2,500 shares of no par common.

CANDIDATES for top FPC and SEC jobs are J. A. Robertson, left, and R. B. McEntire

Kansans May Head FPC, SEC

Robertson, McEntire have edge for top jobs on regulatory bodies, but political considerations may affect choice

Two Kansans appear to have the inside track under the incoming Republican Administration for the leading positions on federal regulatory commissions. But whether it would be politically astute to appoint two men from the same state to the high-level regulatory jobs is a factor which may influence the final selection.

The two men are Jeff A. Robertson, chairman of Kansas State Corporation Commission, often mentioned for a place on Federal Power Commission, and Richard B. McEntire, member of Securities and Exchange Commission, who is SEC's prospective chairman.

Backed by Carlson . . . Robertson is the choice of Republican Senator Frank Carlson of Kansas who is a close adviser to President-elect Eisenhower. If appointed and confirmed, he would replace FPC Chairman Thomas C. Buchanan, now serving under an interim appointment. Buchanan's term could be ended upon confirmation of a successor. Robertson last summer testified against confirmation of Buchanan for a second term at FPC and the Senate declined to approve him.

McEntire is now top-ranking Republican on SEC and has many acquaintances among the Eisenhower advisors. He could be designated SEC chairman with no changes in membership of the commission. However, Chairman Donald C. Cook, an avid Democrat, has indicated he will resign rather than step down from his present position as chairman.

J. Howard Rossbach, also a member of SEC, is serving an interim appointment which could be ended upon confirmation of a successor.

Alternate Suggestion . . . To prevent two Kansans from heading the important federal commissions, some Republicans have suggested that McEntire be given his promotion and that Robertson be appointed as a member, rather than chairman, of FPC.

This would appear to leave the way open for FPC Commissioner Nelson Lee Smith, an Eisenhower supporter, again to become chairman of the body. Listed as an "Independent," Smith leans toward the Republican Party. He is a close acquaintance of Sherman Adams, the New Hampshire governor, who is to serve as Eisenhower's top administrative officer at the White House.

Smith has served on FPC since 1943 and was chairman for a brief period beginning in 1946.

New Vice Chairman . . . FPC recently reelected Commissioner Harrington Wimberly of Oklahoma its vice chairman for 1953. Wimberly has been an FPC member since 1945 and served as vice chairman of the commission in 1952 and during part of 1947 and all of 1948.

Canada's Ban on River Use Blocks Alcoa Project

Canada has informed Aluminum Co of America that it will not permit use of Canadian waters for generation of power for foreign use. Alcoa had sought permission to divert the Yukon River for a smelter and hydroelectric project in the Taiya Valley district of Alaska's panhandle (EW, Sept. 8, 1952, p 99).

Alcoa's power installation called for damming the Yukon near Whitehorse, Yukon Territory. This would back up water to a power tunnel under the international boundary in the Rocky Mountains. The water would drop to two underground power plants on the Alaskan side. Capacity of each plant would be 800,000 hp. The aluminum smelter would have a capacity of approximately 200,000 tons. Alcoa's project would have paralleled and vivaled Aluminum Co of Canada's Kitimat project.

Alcoa announced its smelter-power project last August, but first plans for the development were formulated during World War II.

In a letter to Alcoa, R. H. Winters, Canadian Minister of Resources and Development, made a general statement announcing Canada's intention to prohibit any foreign use of Canadian water power potential.

Alcoa officials in New York last week had not yet commented on the Canadian government's decision.

Iowa Southern Accepts $200,000 Offer by Bechtel

One portion of a $5,393,576 judgment favoring the Iowa Southern Utilities Co has been settled for $200,000 and attorneys expect the entire judgment to be settled for approximately $300,000 more.

Attorneys representing the complaining stockholders and the directors of Iowa Southern have agreed to accept $200,000 from Harold R. Bechtel in settlement of the liability against Bechtel and the estate of George M. Bechtel who were named jointly in the judgment with the estate of J. Ross Lee. (EW, Dec. 22, 1952, p8)

Attorneys expect the Lee estate to yield about $300,000 toward the judgment.

The judgment of $2,258,377, with interest that brought it to a total of $5,393,576, was awarded in a suit that began nearly ten years ago. Stockholders filed an action asserting the Bechtels and Lee acted fraudulently in the purchase and subsequent sale of several small utilities to Iowa Southern when the defendants were owners of all Iowa Southern common stock.

Under terms of the settlement, Bechtel was to pay $127,000 to Iowa Southern on or before Dec. 31. Other payments will begin Feb. 2. Final payment will be made after the Lee estate has been closed. There will be no lien against H. R. Bechtel estate.

Roaring falls . . .

. . . evaporates

Snoqualmie Falls in Washington State became less than a trickle this winter as a result of abnormally low rain and snow fall in the Pacific Northwest during 1952. The photo at the left was taken Dec. 1, 1951 when stream flow measured 4,340 sec ft; the one on the right was taken a year later when stream flow measured 360 sec ft. Puget Sound Power & Light Co has a plant at the falls. Rain and snow during 1952 was considerably less than in '51.

Use of Fly Ash . . .

. . . in cement mixes urged by highway engineer. Tests show concrete has more strength

A trial use of fly ash in concrete mixes is being urged upon the Navy by Comdr W. L. Chilcote, CEC, USNR, and now deputy highways engineer with Baltimore Bureau of Highways. Producers of fly ash, including many power plants, are eager to find a market for it, he says.

Fly ash is a very fine mixture, resulting from furnace-burned pulverized bituminous coal. The particles are collected on the plates of electrostatic precipitators located within the heating system. The ash is filtered and stored.

Fly ash is produced at extremely high temperatures, usually 3,000 deg F. This heat factor, together with its chemical composition gives it certain pozzuolanic characteristics. Mixed with lime, fly ash will slowly combine to form a material similar to natural cement. Likewise, when mixed with portland cement, fly ash will slowly combine with the free lime released as the cement hardens. The result is a dense, greater-strength concrete, with good workability.

Considerable Research . . . The use of fly ash as a source of fines in portland cement concrete mixes and bituminous concrete road pavement mixes has been advocated for many years. Considerable research has been undertaken. A very complete report for example, has been prepared by the G. & W. A. Corson Co, Inc, Plymouth Meeting, Pa., for Consolidated Gas Electric Light & Power Co of Baltimore.

During October 1950 a test section of highway pavement was placed in Baltimore. One half had concrete in which one bag of fly ash was substituted for one bag of cement in the 6½-bags-per-cu-yd mixture. Tests showed that the fly ash concrete had strength of 600 lb psi or one-fifth higher than the plain cement concrete.

The Baltimore Water Supply Bureau has specified fly ash concrete in building its new Liberty Dam.

Commander Chilcote feels that results show that fly ash is useful, and since it is cheaper than cement, considerable money can be saved on larger projects. But he says that fly ash is not an over-all substitute for portland cement mix in every case.

Pelton Dam Rehearing Denied Oregon Utility

Portland General Electric Co's Pelton Dam proposals ran into another barrier recently when Marion County (Ore.) Judge George R. Duncan denied the company's plea for a new hearing before the state hydroelectric commission.

The opinion upholds the commission's ruling of July 11 refusing a preliminary permit licensing construction of the dam and powerhouse on the Deschutes River in Oregon.

The company argued it had not been allowed a proper hearing as prescribed by state law. Federal Power Commission had previously approved the development. The judge ruled:

"There is no right of appeal from the decision of the commission, such decision is final, the only requirement being that the commission follow certain steps in calling and holding a hearing, and this is the limit of the petitioner's right, which may be considered by writ of review."

The court held that under existing law the commission cannot be compelled to issue a license for a dam irrespective of its merits. The commission refused the permit after the State Fish Commission declined to approve company plans for protecting fish life of the river at Pelton site.

FPC OKs Hydro Project

Electric Power Inc, wholly owned subsidiary of Connecticut Light & Power Co, has received Federal Power Commission authorization to build a 37,250-kw hydroelectric plant on the Housatonic River. The project includes a 1,400-ft dam and a storage lake of 1,870 acres. The company is now seeking a construction permit from the State Water Commission.

POWER BRIEFS

● The West's biggest steam plant went into full operation on Dec. 26, 1952 when Pacific Gas & Electric Co completed its $80-million Moss Landing Plant in Monterey County, Calif. The fifth unit went on the line four years and four months after ground was broken for the plant. The plant's capacity is 575,000 kw.

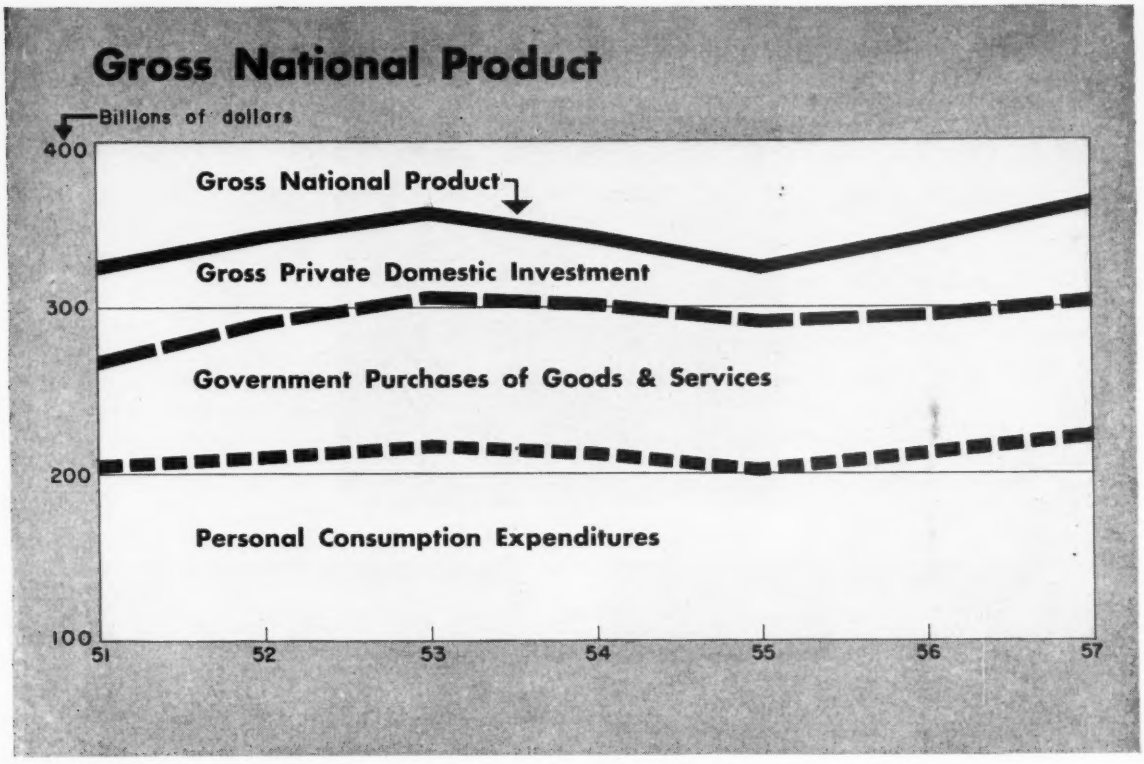
● Icing conditions pulled down steel transmission towers of Bonneville Power Administration twice in December, last year, the first such causes of circuit disruptions on the system. The first break developed when a 1⅜ in. aluminum conductor built up to 5 in. in raining and freezing weather near Bickleton, Wash., on the Midway-The Dalles-Eugene 230-kv line. Steel plates supporting the cable and two towers crumbled. Second breakdown occurred on the Coulee-Columbia No. 1 230-kv line, one of four feeding the Wenatchee area.

● Dutch atomic scientists are seeking funds from industry and government to set up an atomic power breeder, Dr W. J. Beekman, director of the Netherlands Foundation for Fundamental Research, disclosed recently. A contract is expected to be signed with leading Dutch electric companies who would contribute funds for a five-year period and make available laboratories and services. Other industries are expected to contribute also.

● Cleveland Electric Illuminating Co has bought another 173 acres of land in Ashtabula County for resale as industrial sites. This is the third such purchase of land CEI has made in the past seven months and brings the total to 954 acres in Lakeland and Ashtabula Counties. The newest tract is near the eastern city limits of Ashtabula in a heavily industrial section.

● Union Electric Co's instantaneous generation reached a record peak of 1,178,000 kw on Dec. 23, 1952. The company reached a peak of 1 million kw for the first time in August, 1951.

● The December issue of Cleveland Electric Illuminating Co's employee magazine reported that 35 persons attend an organizational meeting of an Alcoholics Anonymous unit on Dec. 1. The group will meet every Monday at the company's St. Clair building for informal meetings "without attendance records involving no obligation of any kind."



Composition of Gross National Product—Billions of Dollars—1951-1957

	1951	1952	1953	1954	1955	1956	1957
Personal Consumption Expenditures	208.0	214.0	220.0	215.0	205.0	215.0	225.0
Gross Private Domestic Investment	58.5	50.0	49.0	39.0	31.0	44.0	57.5
Gov't Purchases of Goods and Services	62.6	80.5	89.0	89.0	89.5	84.0	81.5
National Security*	36.7	51.5	57.5	55.0	50.0	45.0	42.5
Other**	25.9	29.0	31.5	34.0	39.5	39.0	39.0
Net Foreign Investment	0.2	1.0	2.0	2.0	2.0	2.0	2.0
Gross National Product	329.2	345.5	360.0	345.0	327.5	345.0	366.0

* Includes all defense program expenditures except foreign loans.
** Other Federal, State and Local Government purchases of goods and services.

Load Forecasting—

A Method based on Economic Factors

F. WARREN BROOKS, Cleveland Electric Illuminating Co, Cleveland, Ohio

If we were to specify the characteristics most to be desired in a forecasting method, they would include:

1. The forecasts should be closely geared to the fundamental factors affecting the company's business.

2. The correlation between the elements of the business being forecast and these fundamental factors should be sound and logical and proven to offer dependable projection into the future.

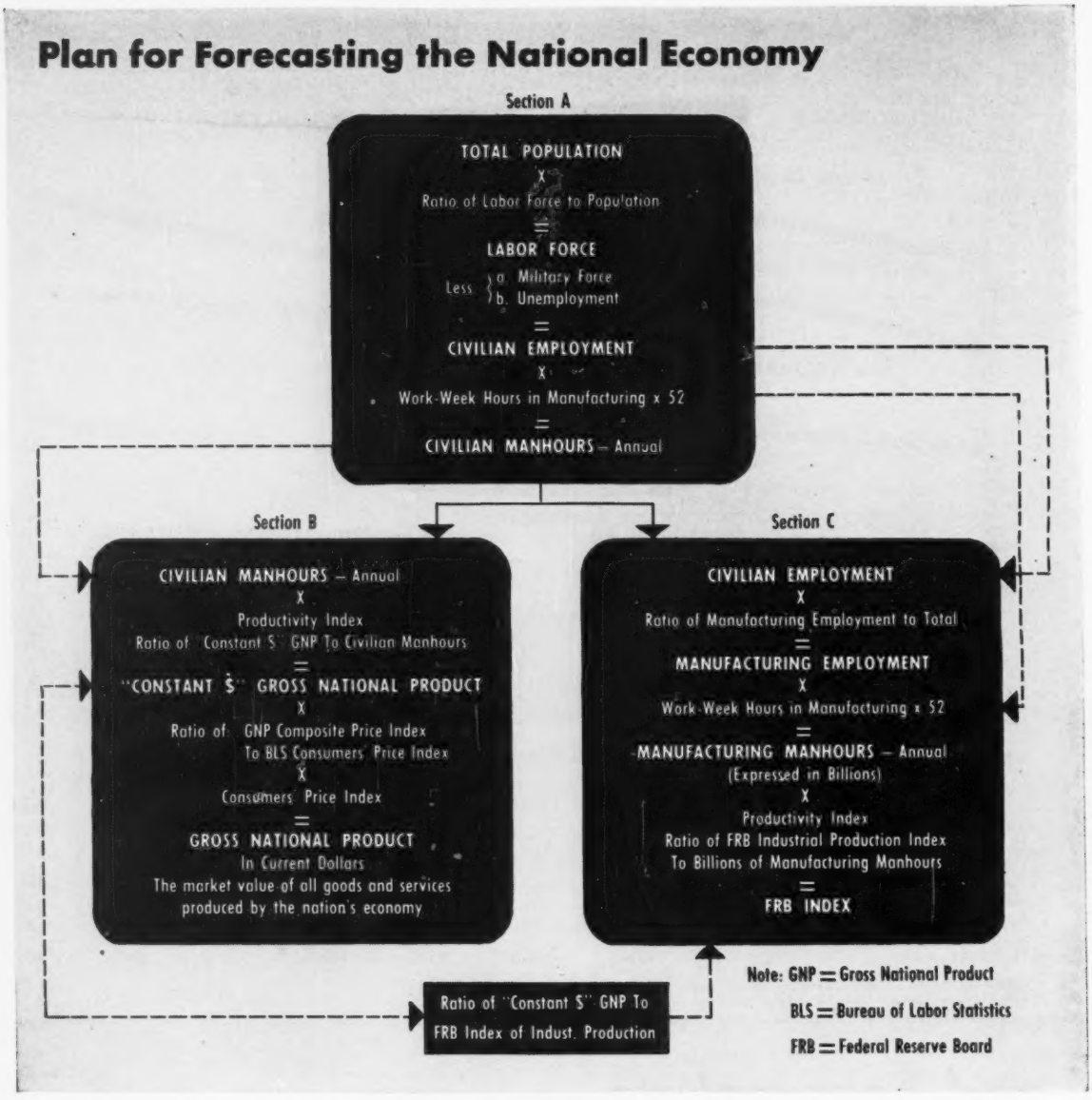
3. The number of these fundamental premises should be at a minimum so that the area for individual judgment and the number of assumptions required to establish this basic framework are likewise at a minimum.

In most industries, the fundamental factors affecting the business levels are local, regional, and national economic factors. This is particularly true of electric utilities; and in the case of those utilities serving areas in which the types of load are well diversified, national economic factors are likely to require little if any adjustment to be reliable indicators of local conditions. In fact, investigation shows that both nationally and locally the correlations have been encouragingly consistent.

A forecasting method based on a relatively small number of *national* economic factors has several added advantages:

1. Many expert opinions are available against which to test the assumptions of estimates as to these various national economic indices.

Presented at the Symposium on Load Forecasting Committee on System Engineering AIEE Fall General Meeting—New Orleans—Oct 13-17, 1952.



2. Measures of national economic conditions are familiar to or within the comprehension of most people, and hence the reasonableness of the assumptions with respect to their future course can be readily appraised by practically any group to which they are presented. This is important not only with respect to internal acceptance of the forecasts on the part of those who will use the data, but it may be even more important in gaining acceptance by regulatory bodies and other governmental agencies whose action may be, in part, dependent upon the acceptance or rejection of forecasts.

3. It is easier to prepare several forecasts representing the range of reasonable probability based on a corresponding range of assumptions as to these basic premises. Also, adjustment of the forecast to conform to changes in probable levels of any of the economic indices may be made more quickly.

In forecasting the level of business of electric utilities, two specific measures of that business level must be considered. One is the energy requirement or kilowatt-hours, and the second is the peak load in kilowatts. Since the total kilowatt-hour sales of a utility and its system peak load represent the composite effect of several distinct classifications of the company's business, such as residential sales, commercial sales and industrial sales, and since each of these various classifications is responsive to somewhat different though generally related economic pressures, separate treatment in the forecast of each classification is most conductive to accuracy.

The relationship between energy requirement (kwhr use) and contribution to peak load (kw) varies significantly among these several classifications. Load factor (the ratio of average hourly use of energy and maximum hourly use in a period) is the usual expression of the relationship between energy use and peak contribution. Such load factors may

vary from 25 to 35% for some uses to over 90% for some types of industrial use. However, for a given class of business, annual load factors follow fairly definite and predictable relationships with such variables as use per customer or national economic indices.

These relationships are most important to forecasting since they enable the determination of basic load factors for each class of service, which can be adjusted to economic and other related conditions.

Utilities have usually forecast energy use by separate consideration of the individual classes, but it is only with the development of better information with respect to load characteristics of the individual classes that we have been able to relate that most important element, over-all peak load, to basic economic conditions.

Of the various economic factors affecting significant portions of an electric utility's business, we have found the Federal Reserve Board Index of Industrial Production to be by far the most important. These are the reasons:

1. The close relationships that exist between this Index and the level of business of the large light and power or industrial classification.

2. The large light and power classification represents over half of total electric utility sales and is the most sensitive of any class to changes in economic conditions.

Forecast energy use and 60-minute peak contribution of each class is determined on a fully diversified "at-the-customer" basis. These data are each then adjusted for estimated applicable losses to an "at-the-power-plant" basis.

Some electric utilities have system peak loads in the evening and others have morning peak loads. Since our objective is to forecast the undiversified sum of the system peaks of all the utilities contributing to the public supply, we must give consideration to contributions of each class of load to the morning peak and to the evening. An adjusting multiplier reflecting this diversity in time of peak among utilities can be applied to the average of these separate determinations to yield the expected undiversified sum of the peak loads of all systems.

The method may be best illustrated by considering each customer classification in turn.

Residential and Rural Sales . . . These are forecast by considering the probable number of customers and the kwhr use per customer. The rate of growth of both has been historically so consistent that little error would be introduced by use of simple trend projections on a constant long-term percentage trend basis. However, some refinements are available by consideration of relationships to economic conditions, and these may be significant in short-term forecasts (up to two or three years). For example, the probable number of customers can be refined by economic analysis of data such as population trends; the rates of family formation derived by giving consideration to historical birth rates, death rates, and other pertinent data and trends therein; the predicted levels of housing unit construction; and the trend of the past historical relationship of number of households to number of electric consumers, the probable levels of disposable personal income, expected levels of appliance production, expected trends in the Consumers Price Index, and the like.

This class of load has an evening peak, and the load factor, on the fully diversified "at-the-customer" basis, can be determined from analysis of load characteristics.

This load factor increases slightly with increasing average use per customer. The basic load factor determined for some specific use per customer requires adjustment to determine the load factor for any other average use per customer.

Experience also shows that the relationship of the morning peak contribution to the evening peak contribution of this class increases slightly with average use per customer. After the evening peak contribution has been determined the determination of the morning contribution becomes a matter of simple arithmetic, using the applicable multiplying factor developed from analysis of the load characteristics of the class.

Small Light and Power . . . Identical techniques to those employed for the residential and rural class may be employed for the small light and power class. Different relationships affect the number of customers and the growth in use per customer, and the numerical values of the load factors and their various adjustments are different. The composite class has a higher morning than evening peak and higher than residential load factor.

Because the small light and power class as presently and historically reported for the nation includes a mixture of customer groups whose loads have morning peak characteristics and those whose loads have evening peak characteristics, the determination of the load factor, peak relationships, and adjusting factors requires particularly careful development.

Large Light and Power . . . The treatment accorded the large light and power class is likely to have far greater effect on the validity of the overall results of the forecasts than that of any other classification. This is true not only because it is the largest of any single class but also because it is the most sensitive in reflecting changes in economic conditions.

To the extent that data are available, it is highly desirable to treat separately such heavy power and high load factor loads as aluminum and magnesium reduction. Loads such as these do not necessarily follow fixed relationships with general business levels, and changes in the level of operation of these industries can produce significant changes in the over-all results. If the requirements of the operations of the Atomic Energy Commission are to be included in the forecast, these too of course require separate treatment.

The remaining large light and power class is the one that most directly and consistently reflects varying levels of business activity. It is thus natural that for this class, national economic conditions may serve rather directly as a basis for the determination of the peak contribution.

For the Nation as a Whole . . . For the entire nation and many systems individually, the relation of the kwhr sales to this class and the Federal Reserve Board Index of Industrial Production has followed an extremely consistent trend throughout the ups and downs of the business cycle in the last ten years at least. Thus, forecasting the kwhr sales for this class involves forecast of the level of the Federal Reserve Board Index of Industrial Production, a projection of the past relationship of kwhr sales per point of the Index, and then the multiplication of these two elements.

When it comes to determining the contribution of this class to peak loads, annual relationships alone is not enough. The specific conditions pre-

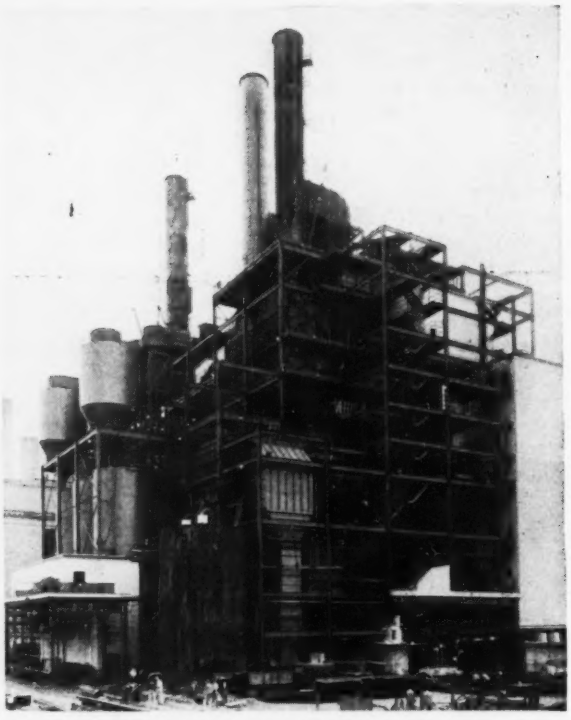
(*Continued on page* 142)

Philadelphia Electric's

Adds 250,000 New Kilowatts at Delaware Station

Two 125,000-kw units in independent addition adjacent to 186,700-kw existing plant make this second largest Philadelphia station. New plant is system's most efficient

D. F. SCHICK JR and **U. S. SHUMAN**
Philadelphia Electric Co



SEMI-OUTDOOR ARRANGEMENT of new Delaware has all equipment exposed above and beyond the burners. Turbine room, bunker loading room, water treating room and chlorinating room are enclosed

Land availability and adaptability of the existing electrical system were among the key factors that warranted an independent addition adjacent to Philadelphia Electric Company's well-known Delaware Station near downtown Philadelphia.

To begin operation shortly, new Delaware will add two 125,000-kw units to the 186,750 kw that exists bringing the combined capacity of Delaware Station to 436,750 kw and making it the second-largest station on the company's system. Significantly, also, the new plant's semi-outdoor arrangement incorporates an 1,800 psi, 1000-1,000 F reheat cycle that is expected to achieve a 9,000 Btu per kwhr full-load net heat rate. This will make new Delaware the most efficient plant on the company system. It's location near down-town Philadelphia focused particular attention on ash control features of the plant design.

Output of the two new 125,000-kw turbine-generators is delivered at generator voltage to two 4-section 13.8-kv ring buses in the old station via isolated-phase bus. The twin steam generators that supply 875,000 lb per hr each to these machines use radiant-pressurized design and gas recirculation as contributors to the thermal economy.

Mechanical Design Features—I

Paramount in realizing higher station economy at new Delaware were the reheat boiler and turbine. Moreover, selection of turbo-generators as large as 125,000 kw resulted in a lower investment per unit of capacity. Although the turbine generators are of dissimilar manufacture they are in other respects almost identical and this similarity has been maintained with respect to the feed-water cycle, the boilers and auxiliaries associated with the two units.

The turbines are 3,600-rpm, tandem - compound, reheat - condensing, three-cylinder triple exhaust units. Their generators are rated 125,000 kw, 0.85 pf 147,059 kva at 0.5 psig hydrogen and 13.8 kv.

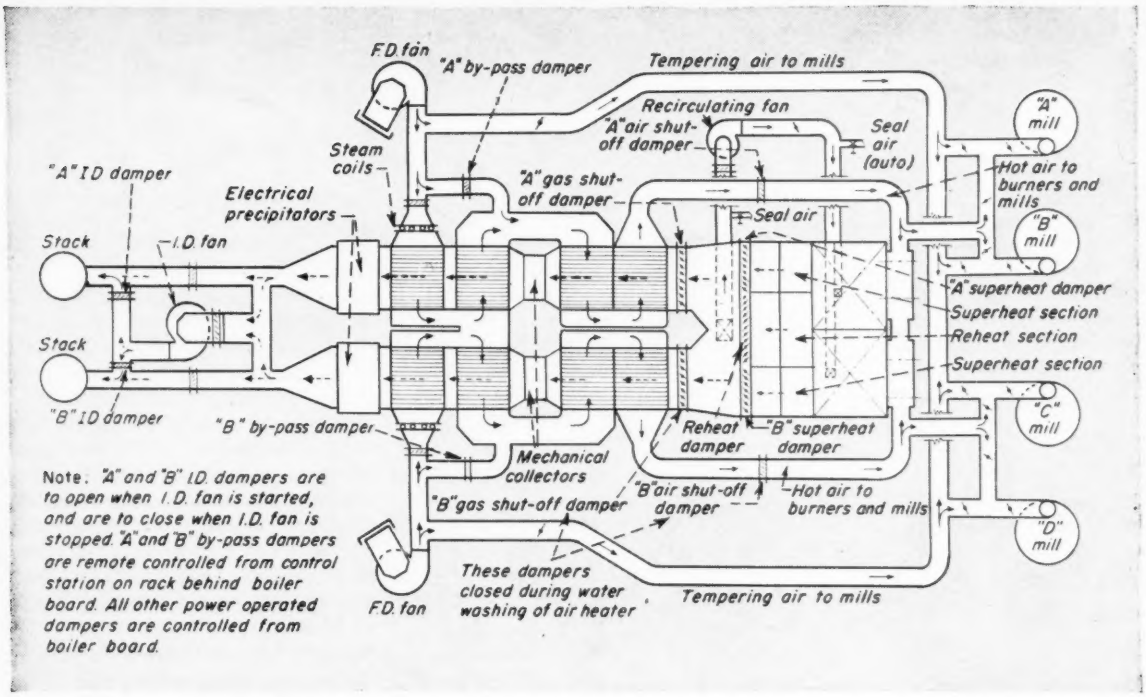
Steam enters the turbine at 1800 psig and 1,000 F and leaves the high pressure element at 400 psia and 625 F. In the reheat section of the boiler it is boosted to 1,000 F and returns to the intermediate element of the turbine through an interceptor valve at 360 psia. Leaving the intermediate element steam flow divides among the three low-pressure elements and exhausts to the condenser.

A single circulating pump serves each condenser, valved so that one circulating pump can furnish water to both condensers in the event of outage. Each condenser is equipped with one mechanical air pump and one set of twin steam ejectors.

The turbine has seven extraction connections at pressures ranging from approximately 5 to 700 psia to feedwater heaters. The final feedwater temperature to the economizer will be approximately 500 F at full load. All heaters are of the horizontal type.

Low pressure heaters and drain coolers are located in the basement between generator foundations. The high-pressure heaters are on the operating floor between the turbines. While there is no duplication of heaters, the arrangement permits by-passing of groups of heaters.

Two condensate pumps are provided per unit and only one is required for full load. Two boiler feed pumps are


F.D. fan
"A" by-pass damper
Tempering air to mills
Recirculating fan
"A" air shut-off damper
Seal air (auto)
"A" mill
Steam coils
"A" I.D. damper
Electrical precipitators
"A" gas shut-off damper
Hot air to burners and mills
"B" mill
Stack
I.D. fan
Seal air
"A" superheat damper
Superheat section
Reheat section
Superheat section
Stack
"B" I.D. damper
"B" by-pass damper
Reheat damper
"B" superheat damper
"C" mill
Mechanical collectors
"B" air shut-off damper
Hot air to burners and mills
"B" gas shut-off damper
"D" mill
These dampers closed during water washing of air heater
F.D. fan
Tempering air to mills
Note: "A" and "B" I.D. dampers are to open when I.D. fan is started, and are to close when I.D. fan is stopped. "A" and "B" by-pass dampers are remote controlled from control station on rack behind boiler board. All other power operated dampers are controlled from boiler board.

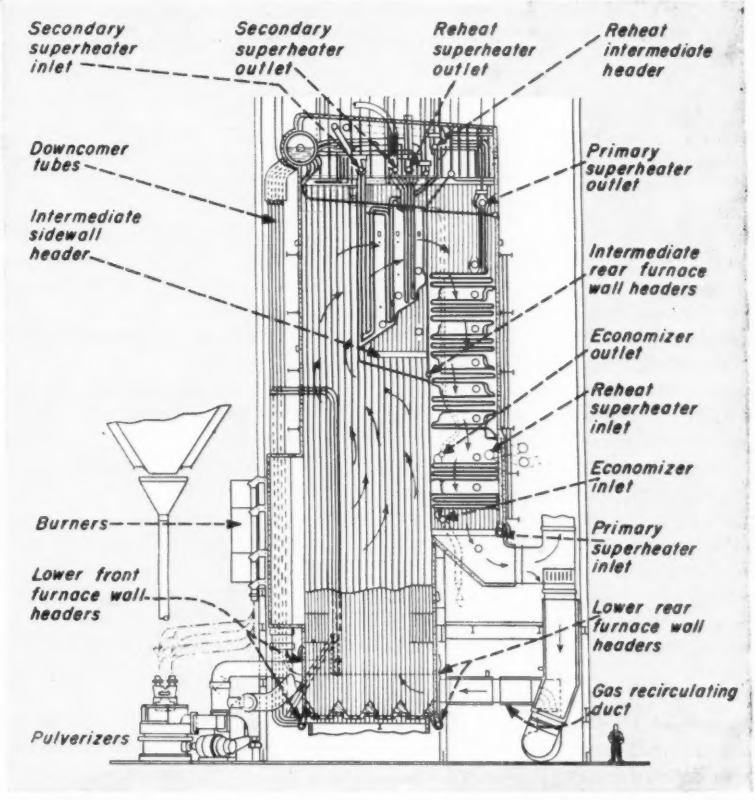
GAS-FLOW AND AIR-FLOW LAYOUT—The single recirculating fan takes gas from economizer outlet and discharges it to furnace bottom to control steam temperature. Gas flow is controlled by damper in inlet. Pressurized boiler design requires two forced-draft fans to keep furnaces under positive pressure. An induced-draft fan is provided but is not normally used. Note provision of two stacks per boiler

provided per unit and in addition, a spare pump is provided to serve either unit.

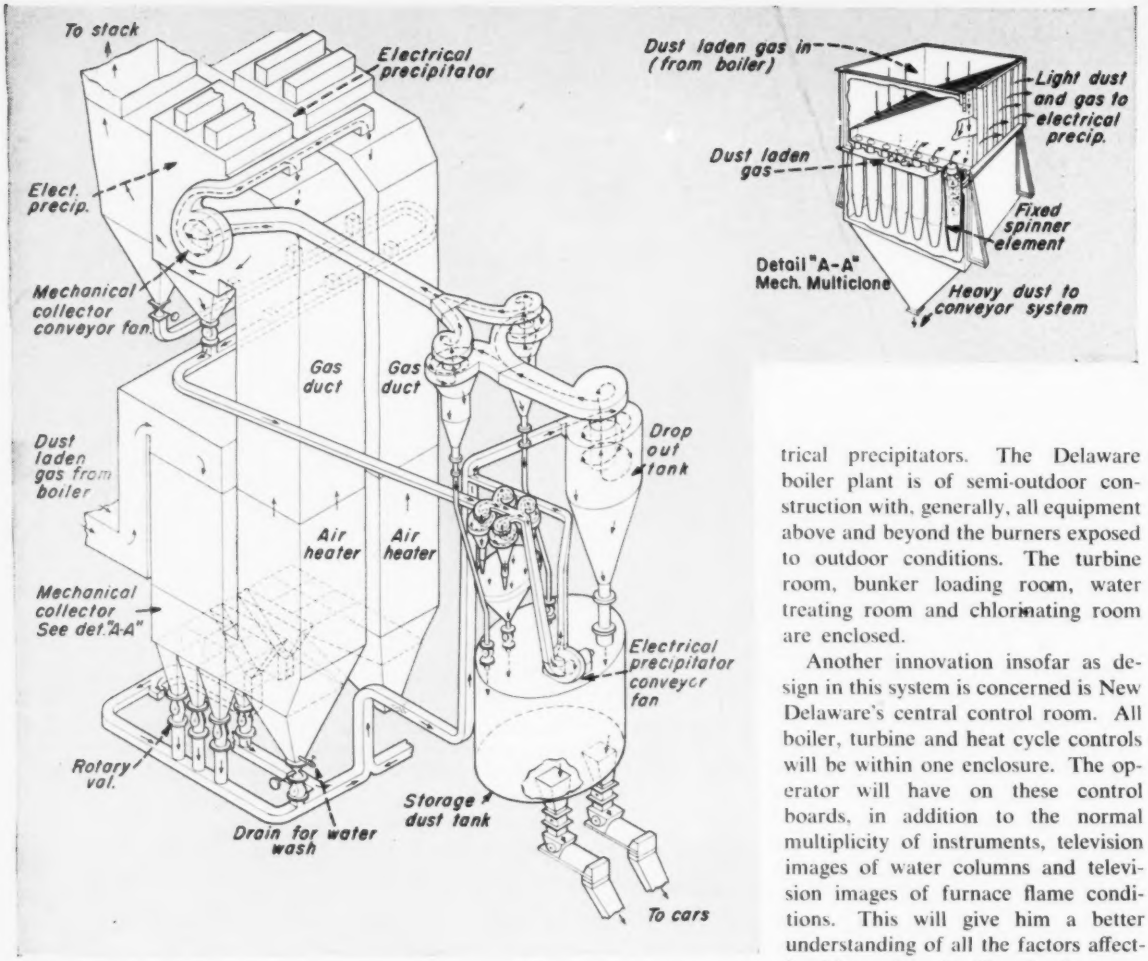
Condensate passes through the four low pressure heaters at 275 psi, directly to the boiler feed pump suction header. Each of the five boiler feed pumps is equipped with a feedwater regulator. The water then goes through the three high pressure heaters at 2300 psi and thence to the economizers.

Boilers . . . The 875,000 lb per hr boilers, 1,875 psig, 1,000 F initial temperature and 1,000 F reheat, are of radiant-pressurized design. The pressurized design boiler with its gas tight casing will insure high efficiency. It is expected that at full boiler capacity overall efficiency of 91.3%, including the air heater, will be realized. The pressure casing, of steel plate, will be welded against the outside surface of the 3 in. O.D., 3 in. spaced tubes. Refractory will fill in the voids under the plate. Insulation will be attached outside this steel casing. The gas and air tight design along with a tubular air heater will prevent leakage so that only 15% excess air will be maintained at boiler and air heater outlet.

Boilers were selected to burn a wide



RADIANT PRESSURIZED BOILER with gas tight casing was selected to insure high efficiency. Gas and air tight design with tubular air heater prevent leakage



COMBINATION COLLECTORS and conveyor system for control of fly ash. First stage mechanical collector is between air heater sections; electrical precipitator at second stage air heater outlet. Separate continuous conveyor systems serve both systems

range of Central and Western Pennsylvania, and Northern West Virginia fuels. Their four pulverizers are suitable for operation with 55 Hardgrove Grindability coals.

The design also provides for full capacity when burning oil. The main fuel oil tank has a capacity of 1,000,000 gallons of heavy oil.

Another special boiler feature is the single gas recirculating fan. This fan recirculates gas from the economizer outlet (600F) back to the bottom of the furnace. It is the major means of controlling steam temperature. The gas flow through the fan is controlled by a remotely operated gas inlet damper.

Pressurized Furnace Design . . . Use of two forced-draft blowers per boiler were dictated by the pressurized furnace design. Under normal conditions only the forced draft fans will be used and the furnace will accordingly operate under positive pressure. At full load each fan delivers 130,000 cfm at 36 in. static pressure. Due to the fan exposure acoustical treatment is provided.

To assure better reliability one induced draft fan is installed for each boiler. But this unit will be placed in operation only when unusual conditions necessitate the boiler operating under negative pressure. This condition may arise with certain severe ash hopper conditions or for routine maintenance or repair without outages. This minimum of I.D. fan operation will effect substantial power as well as maintenance economies.

Semi-Outdoor Design . . . The company's recently-completed Barbadoes Station used partial outdoor construction that included air preheaters, mechanical fly ash collectors and electrical precipitators. The Delaware boiler plant is of semi-outdoor construction with, generally, all equipment above and beyond the burners exposed to outdoor conditions. The turbine room, bunker loading room, water treating room and chlorinating room are enclosed.

Another innovation insofar as design in this system is concerned is New Delaware's central control room. All boiler, turbine and heat cycle controls will be within one enclosure. The operator will have on these control boards, in addition to the normal multiplicity of instruments, television images of water columns and television images of furnace flame conditions. This will give him a better understanding of all the factors affecting his work and will make for more efficient operation.

Fly Ash Control . . . The desire to insure clean atmospheric conditions in the vicinity of the plant led to the selection of combination collector units for fly ash removal. This method has been applied with success heretofore on this company's system. However, refinements in the actual collection and removal system are introduced. As a result it is expected that collections units at Delaware will result in stack emissions limited to 0.1-lb of fly ash per 1,000-lb of gas, far below any objectional emission figure, or code specification. As previously mentioned the first stage mechanical collector is located between air heater sections. The electrical precipitator is located at the second stage air heater outlet. Based on anticipated fly ash particle size and loading it is expected that overall collecting efficiency above 96% will be realized.

Separate continuous conveyor systems are installed for the mechanical

collector and electrical precipitator. This was done to insure removal of collected fly ash which so often has been re-entrained from hoppers into the gas stream.

An unusual feature is the application of two 70-ft high, 9-ft O.D. steel stacks per boiler above the roof. Due to the method of gas discharge, the duct arrangement led to this use of two stacks per boiler, and due to the limited height of the stacks and better distribution of loading, an overall economical design resulted. A restricting orifice at the stack outlet nozzles insures high velocity discharge of gas and adequate dispersion in the atmosphere.

Electrical Design Features—II

The decision to install additional system capacity adjacent to the existing Delaware Station was predicated on availability of transmission and distribution facilities to accommodate the new generation as well as upon the comparative costs of establishing a new connection to the system.

The original 13.8-kv bus in the existing station consisted of a six-section phase-isolated ring bus with reactors installed between the third and fourth as well as the first and sixth sections. This bus was supplied by six generators totaling 186,750 kw and connected to the 66-kv systems by two 75,000 kva transformers.

For the existing bus to accommodate the two new units as well as the existing generators, the six-section ring bus was converted into two four-section ring busses tied together through current limiting reactors. The establishment of the two additional bus sections provided the necessary points of connection for the two new units without requiring any change in the arrangement of equipment on the original six sections.

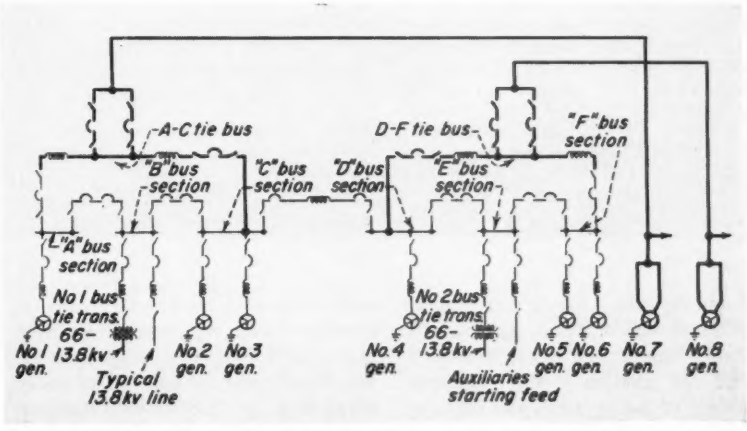
Generators . . . The generators, when purchased, were the largest single-shaft 3,600-rpm units available. Both units have identical ratings although purchased from different manufacturers, as has been previously mentioned. They are hydrogen cooled, designed for 0.80 short circuit ratio, 85% pf, and rated as follows at 13.8 kv: 125,000 kw at 0.5 psi hydrogen pressure; 143,750 kw at 15 psi hydrogen and 156,250 at 30 psi hydrogen.

The machines have two windings brought out to separate terminals. Each winding is connected in wye and the two sets of phase terminals are solidly paralleled to form a single set of leads. One set of neutrals is connected to ground through a neutral breaker in series with an existing two ohm ground resistor.

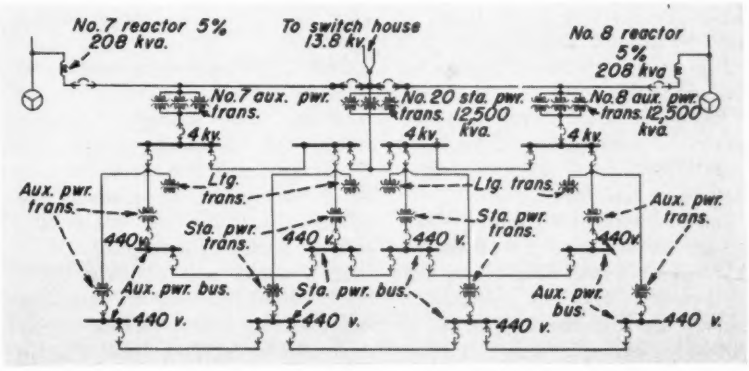
The excitation system consists of one 350-kw, 375-v motor driven generator set of the fly-wheel type, for each unit and one motor generator set in reserve. Automatic, static type voltage regulators are provided on the main unit exciters only.

Generator Leads . . . The generator leads for the two units are phase isolated metal enclosed bus with a nominal 7,000-amp rating, 15-kv, 110-kv basic impulse level. The phase isolated construction is carried up to the generator terminals with short sections of 3,500-amp bus that are used to parallel the two generator windings. Taps are made directly off the 7,000-amp leads with 1,200-amp phase-isolated bus to the potential transformer and ground switch compartment and to the auxiliary power feeder. The 7,000-amp bus runs through the new turbine room and then outside to the existing switchhouse where it ties into the 13.8-kv bus through two 4,000-amp air blast circuit breakers in parallel.

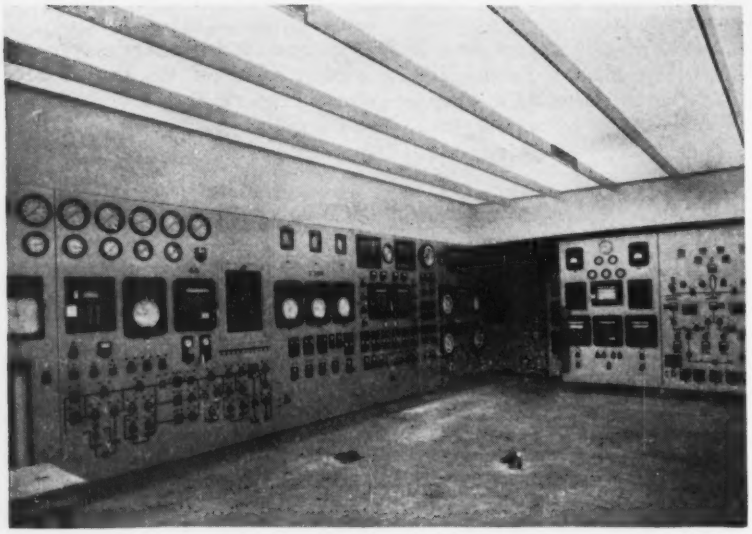
The problem of inductive heating



NEW UNITS NO. 7 & 8 are connected into two four-section ring buses. In original Delaware Station the existing six units were connected to a six-section ring bus. Addition of the two new sections avoided any change in the arrangement of equipment


No. 7 reactor 5% 208 kva.
To switch house 13.8 kv
No. 8 reactor 5% 208 kva
No. 7 aux. pwr. trans.
No. 20 sta. pwr. trans. 12500 kva.
No. 8 aux. pwr. trans. 12,500 kva.
4 kv
Aux. pwr. trans.
Ltg. trans.
Sta. pwr. trans.
440 v.
Aux. pwr. bus.
Sta. pwr. bus.

AUXILIARY POWER SUPPLY for new Delaware units No. 7 and 8 follows the unit system with each turbine generator supplying its own auxiliaries. Station power needs are fed from the existing plant's 13.8-kv bus by a cable installed in a transite duct



Center of Operations at New Delaware

The station control room contains the control of practically all elements except the primary control of the generators, the water treatment system and the coal handling facilities. The primary control of the generators is located in the control room of the existing station, the water treatment equipment is controlled from its own local control center and the coal handling from local control stations.

The main control boards are steel of the vertical self-supporting type, arranged in a "U" shape with the unit boards facing each other and like panels directly opposite. The station master and station auxiliaries control panels are mounted side by side at the end completing the "U". Auxiliary panels such as coal feeder controllers, auxiliary power relays, dc-control distribution and sectionalizing, and combustion control are located in the rear of the main panels.

All main switchboards are shock mounted to guard against a possible effect of vibration. The boards are finished in opalescent gray.

of adjacent steel which accompanies the installation of busses of such high ampere ratings was carefully investigated. In addition to the usual precautions of fading bands and breaking up short-circuited loops of steel, an amortisseur grid was installed between the bus and the supporting steel.

Auxiliary Power System . . . The design of the auxiliary power supply is based on the unit system. Each unit during normal operation supplies its own auxiliaries from a 13.8-4.0 kv, 12,500 kva dry-type, forced ventilated transformer connected to the generator leads through a 5%-208 kva reactor and an air circuit breaker.

The auxiliaries common to the station are supplied from a 13.8-4.0 kv-12,500 kva dry type, forced ventilated transformer. This transformer is normally fed from the 13.8 kv bus in the existing station by means of a full voltage insulated cable installed in transite duct in air. This cable also supplies energy for starting the units and serves as a back up in case of trouble with the equipment in the normal supply. In case of an outage of a unit transformer the unit 4.0 kv bus is supplied from the station auxiliary transformer.

The design voltage for the auxiliary power system is a nominal 4 kv for all motors above 200 hp and 440 volts for motors of 200 hp and below. However, some deviation in this practice is allowable.

The 12,500-kva transformers are set adjacent to the 4.0 kv switchgear and feed the gear through 2000-amp 150,000-kva electrically-operated air circuit breakers which supply the 4 kv across the line starting motors as well as the 440-volt load centers and 220/110-volt station lighting gear.

Each 4.0-kv unit auxiliary power bus supplies two 440-volt load centers and one station lighting supply center, while the 4.0-kv station auxiliary bus supplies four 440-volt load centers and two stations lighting supply centers.

The 440-volt load centers are each designed in two sections. The breaker section serves the large 440 volt (50 to 200 hp), across the line, starting motors and miscellaneous feeder circuits, while the second section consists of industrial type contactors and manually operated blocking breakers for supply to small 440-volt motors.

The load center breakers where remote control is required are operated by 250 volt dc while the industrial type contractors are ac-operated using 440 volt when control is local and 220-volt when control is remote, the 220 volts being obtained by means of an individual control transformer mounted with each contactor.

The electrical design of the 440-volt system is such that should a transformer or supply fail the entire load of the particular load center affected can be transferred to another load center supplied from a different 4.0-kv bus.

With the exception of the load centers at the screen basin the transformers are of the Class H nitrogen-filled, sealed type. Four of these units are rated 500 kva and four 750 kva. Screen house load center transformers are installed outdoors and are oil insulated, self-cooled, rated 112½ kva. Four lighting supply center transformers are Class H, sealed nitrogen-filled.

Relaying . . . The generators, generator leads, 13.8 kv bus and auxiliary power transformers are protected by overlapping differential relays. Phase backup protection is provided at the generator by the use of non-directional overcurrent relays with voltage restraint. Phase and ground backup non-directional overcurrent relays are provided on the auxiliary power transformers and on the 13.8 kv bus.

A reverse power relay is incorporated in the relay scheme as a means of shutting down the unit and its associated boiler in the event of loss of steam supply. The primary purpose of this relay is to prevent damage to the reheat tubes of the boiler when steam flow is lost.

All 4.0 kv busses and their feeders are protected with overcurrent phase and ground relays. Under voltage relays are provided on all 4.0 kv busses except the screen house bus. The 4.0 kv transformer feeders and the 4.0 kv motors are protected with overcurrent phase and ground relays which are equipped with instantaneous overcurrent elements.

Sell . . . and Sell . . . and Sell

Intensified Selling Will Pave the Road Ahead

Distributors of electrical apparatus and supplies have a key role in promoting greater use of electricity

GEORGE F. HESSLER, Vice President, Graybar Electric Co, Inc and President, National Association of Electrical Distributors

The electrical industry, especially in its vast, complex field of apparatus and supply products, is the nation's greatest growth factor. More effective application of energy and electrical products, when used in increasing measure to modernize the three basic markets of homes, industrial plants and commercial buildings, offers the one sound reason why our American economy will never stop growing. It will be the means by which our economy will meet the challenge to produce more economically and to sell its many services more efficiently. And, since that can be the only answer to the problem we are soon to face, the electrical industry has a major responsibility to pave the road ahead through greatly intensified selling.

Estimates of our economic future, like any other estimates, should not be based on sentiment. Even a casual glance at the problems now developing will bring to light many raw facts as well as some difficult question marks. Only if we set forth the probable facts with complete objectivity can we form a logical pattern from which we can deduce certain well defined trends.

We are approaching a time when defense spending probably will slacken, and, most likely, leave a gap in our economy, with the attendant problem of maintaining full employment. This is a direct challenge to every industry, every business, and especially to every salesman. There is obviously only one solution—fill the gap by selling all the consumer and other goods we can produce. To do that

successfully, in fact even to undertake it at all, we must **now** develop better sales techniques and raise them to the highest point of efficiency of which we are capable.

A good picture of the approximate size of this job can be obtained when we study the rate of American industrial expansion. A very conservative estimate shows that our country's overall productive capacity has increased by more than 50 percent. This is further pinpointed in a report prepared recently by the McGraw-Hill Dept. of Economics.

Using 1939 as the index (100), we find that the following industries had expanded by 1952 in these ratios:

Steel—141. Machinery—307. Electrical machinery—403. Autos—184. Transport equipment—438. Food—156. Chemicals—357. Petroleum refining—192. Other manufacturing—149. All manufacturing—203.

Note that the second biggest increase was recorded in our electrical industry. It is a fair deduction to conclude that the increases in all other industries were made possible primarily through a wider utilization of electrical energy harnessed to bigger and more complex patterns of electrical products.

Can We Do the Job? Yes!

Can we as a free, energetic and enterprising nation utilize fully this vast new capacity to produce? I believe we can. In the process, several elements will be fundamentally involved—population growth, new and much wider uses of electrical energy, greater advances in electronics ,chemicals, plastics and many other key industries.

Subconsciously, the majority of business executives probably are fully confident of our economic future, but it is quite obvious that many tend to view with alarm in their verbal and written statements.

While on my vacation last summer, I had time to reflect considerably on the concern, right down to a state of worry, which was upsetting my contemporaries in business. What they had feared for a number of years was happening to them. There was a lot of anxious questioning which added up to—Was America overbuilt? Every supplier they knew had greatly increased his productive capacity. But who was going to take this output? Were we capable of selling it?

Then one day I dropped into a quaint old New England inn where a quotation was displayed which seemed to hit right home. It read: REMEMBER, TODAY IS THE TOMORROW YOU WORRIED ABOUT YESTERDAY! This truism gave me a great lift!

It has always been my belief every problem can be resolved by reason. But when worry creeps in, reason goes out and sometimes we get hurt.

Unlimited Opportunity Beckons

The fact is that in the short span of several generations the American people have accumulated sufficient wealth and enough experience with electricity to require 70 million kilowatts of generating capacity to meet their needs, and the future is even brighter. The forecast for 1961 is a requirement of 150 million kilowatts.

Think of it! An anticipated increase of more than 100 percent in less than ten years. And we are still only on the threshold of the age of electronics.

Electric power systems in America are adding to their distribution systems at a rate four times greater than ten years ago, or approximately one billion dollars a year, according to Electrical World. You can multiply this four, five or six times to envision the current market potential for electrical products to consume this output.

Going a step further, to the undeveloped, you can forsee all the better ways of life which will accrue to our rapidly growing population, bringing more opportunity to us in the electrical industry.

Electricity has pointed the way in the past to comfort and progress. It has multiplied manpower, reduced physical labor, and permitted the rapid advance of mass production. Consider, then, what it will be called upon to do in the future and you will see that the more than 100 percent increase in required capacity is truly a conservative estimate.

Economists' evaluations, based on present conditions and available data, predict an industrial output of 260 billion dollars a year by 1961, an increase of 40 billion dollars over the present. They forecast a reduction in the average work week from the present 43.9 hours to 40 hours, an increase in output per man hour of roughly 25 percent, yet an increase in the entire work force of only 3½ million. In order to attain that production estimate and increased man hours output, therefore, we are going to have to rely heavily on electrical energy.

The rate of industrial and business expansion today, even after the past few years of consistent growth, continues unimpeded. In the period 1944 to 1950, more than 3 million new businesses sprang into being in response to opportunities created by the country's expansion. The mortality rate during those years was two million, leaving a very substantial increase.

Continually Expanding Markets

Today research and invention are opening entirely new vistas to undeveloped, unexplored products which will be tomorrow's staples. Things are being discovered daily which add to man's comfort, well being and life span. And with these developments come the expansion of industry, the creation of newer and greater needs and desires, and the expansion of the potential market for these products because of prolonged, more productive life of our people resulting from increased life expectancy.

The expansion of industry is like the growth of a snowball rolling down-hill. Because industries are so interlocking and so interdependent, the health of a few cannot help but be reflected in the health of all. Therefore, we see the great growth in transportation is pacing a growth in the oil industry, just as the tremendous sale of appliances paces the growth of consumption of electrical energy.

All this increased industrial capacity must and will have an outlet because the people who are creating it have planned carefully for a fuller expanding economy. They are shooting for a 52 billion dollar increase in gross national product by 1961—and I, for one, believe they will attain it.

Actually, I think their estimates are conservative, and if you want to know why, you have only to consider this: By 1961, it is anticipated we shall have increased our population by one-sixth—to 175 billion. The 52 billion dollar increase in gross national product projected for that year is only slightly more than one-sixth. Therefore, you

can see it is a conservative estimate of expansion because it does not take into consideration new needs and new demands to be created by a higher living standard.

Carry this population analysis a little further and apply it to our own industry. The prognosis tells us that two million new family units will come into being by 1961. That means as many new homes requiring more appliances, which will raise the utility load and, to complete the cycle, create more sales for electrical supplies. An additional factor will be the people on pension. Old people will account for a considerable portion of this population increase and, because of modern pension programs, will be better able to maintain separate lodgings, increasing the need for new housing.

A while ago we were deeply concerned lest we not be able to support a defense and a civilian economy side by side—and we did! In fact, for a short time the pendulum swung more in the direction of a falling off in civilian demand than in the direction of a sopping up of available civilian materials for defense needs. True, for a while the situation was tight and in some instances still is. But it never did seriously curtail our civilian economy and we are rapidly working out whatever necessary adjustments remain to be made.

Higher Living Standard

The current TV bonanza is indicative of what can happen in a dynamic, constantly changing economy. Only a short time ago our warehouses were glutted with TV sets and it looked as though the market had reached its saturation point. Yet who could accurately forecast, for example, the television excitement which hit Denver with the lifting of the "freeze", where every available space, even mortuary windows, was being rented for display and demonstration?

On the basis of past experience, I believe I can confidently state that we are in for an age of development and expansion beyond our fondest expectations. We are gravitating towards a continued higher living standard for our people in an economy which will support adequately both defense and civilian production. I have several reasons for saying this:

First, the climate of business today is one of cautious confidence, marked by bold planning. Fear and panic which have done more to create economic lulls than have actual conditions, have been replaced by faith.

Second, the planning that business is doing today is not short range but long range, geared, as we have seen, to answer the demands of a growing and aggressive nation.

Third, and most important, I think business has learned its lessons from the past. It fully realizes that every boom is not prosperity nor is every bust a depression. It anticipates leveling-off periods and is beginning to look on them as time for regeneration, for a re-tooling of ideas to fit the changes in our economic order.

Fourth, much progress has been made in the reduction of opposition to technological developments. Technical advances once regarded as schemes to reduce the working force are becoming more and more welcomed as the harbingers of greater opportunities in more and better jobs —even by the unions!

Fifth, economic literacy has become more widespread, due in large measure to the educational efforts of industry. I'm certain that more people realize today that labor, management, and capital have interlocking interests and all deserve their place in our economic scheme.

Sixth, the individual is better off than he ever has been. His savings are greater despite excessive taxation. His future is being made more secure by industry's social consciousness in the form of pension plans, hospitalization programs, accident and sickness benefits, and the like.

Creative Selling Needed

The stage is set for a vast improvement in the already high standard of American living. In a speech last fall Arno Johnson, research director of the J. Walter Thompson Co, said that "Americans must learn to live a third better within the next five years in order to keep our tremendously expanded productive capacity working." It is the task of business, especially our electrical business because it is such a large factor in better living, to teach our people to live better, to want more and better things. And the teaching must be done by creative selling.

In addition, we distributors must revive the pioneering spirit and return to the courage of our convictions. In the past we have endeavored to do more than just handle and sell goods. We have endeavored to open new markets, guide the manufacturer in his production planning and product

The Apparatus and Supply Distributor's Creed

To make service the basic ingredient of all my sales activities and my primary purpose for being in business.

To activate any service program through better education and coordination of my internal organization with a view toward making available to the customer those special talents he requires to help him to solve his problems.

To maintain all units of my organization at maximum efficiency in order to make available all types of electrical products and equipment when and where needed. This purpose shall govern the maintenance of proper stocks, the improvement and expansion, where necessary, of counter and warehouse facilities and the institution of fair and equitable credit policies, better to serve the buyer.

To keep in touch with customer and industry problems, in order to be prepared to meet them, through affiliation with industry and trade associations, cooperation with industry programs, promotions and other sales activities and serving in an advisory capacity wherever my special talents and knowledge are required and sought.

To maintain a spirit of close contact and cooperation with my suppliers in order better to advise them in their production planning and fit my programming in with theirs, so that together we can meet market requirements successfully.

To perform my functions of selling, stocking and servicing in such a manner as to impress upon the customer my position as a vital, integral part of the chain of effort which makes available to him the things he needs.

To conduct my business on such a high ethical plane that it will be looked to as an organization from which the public can buy with confidence and where it will find leadership for industry and for the community.

development. In justification of our position, I feel we distributors are going to have to do more of this as time goes by. We are going to have to do a little more pioneering and accept the responsibility for helping to pace the manufacturer and the market.

The fact that we are in an age of interdependence both poses the essential element of our national problem and provides the obvious solution to it. Our great electrical industry, with its five major branches of manufacturers, utilities, distributors, contractors and dealers, is a perfect example of interdependence although we are still far short of perfection in performance.

Sound thinking has created a sound industry, due in large measure to the constructive work of trade associations and their staffs in NEMA, EEI, NAED, NECA and NARDA. These constitute an electrical family in which all members are interdependent but in which none is wholly dependent upon the others.

Each member of the electrical economic fraternity must do his part in selling. And no one component of this group can overlook the effect on the end user.

The manufacturer who produces the products has a responsibility of making them completely modern and well designed and giving adequate service at less cost. He has a big responsibility in the training of sales forces to sell to all other members of the electrical industry group, and that includes the training of his distributors' present and potential sales forces. The manufacturer's responsibilities also embrace the field of marketing in its modern approach so that he and his distributive organization will get their proper share of business to be had in each trading area.

The Electric Utilities' Stake

Utilities should be made cognizant of electrical industry programs other than their own, for they are constructively motivated, through their own self interest, toward fulfilling the need for proper load building and through the angle of good public relations.

The electrical contractor needs to know modern values and proper practices so that he can join hands in the chain of selling. He is a very valuable part of the interdependent team and we, as distributors, must try to show him how he can better serve the values we supply.

The International Association of Electrical Inspectors likewise has a service to sell in safety standards and we can be pretty certain that if they know of the electrical industry's programs and are able to undertake a larger degree of cooperation they too can become an important selling force.

The retailer, because of his knowledge of product and end use, can forge the last substantial link in our chain of selling for he will point out to the consumer the values in products, the necessary standards of wiring, particularly in regard to safety, and many other important elements that make up electrical living.

And certainly the International Association of Electrical Leagues is doing an excellent job in the larger cities in all types of sales and promotion. An electrical league, of course, is a smaller vertical section of the entire industry and is truly representative of it. The promotions of various leagues have traditionally covered a wide range of interest from adequate wiring to various product campaigns in which many thousands of dollars have been spent in advertising and other phases of selling.

I have left the apparatus and supply distributor last because this happens to be my own business and I know much of the good work that is being done in facing up to the challenge of selling now and for the future.

In our field alone we have several hundred thousand products to sell that enter every market, every building and every business as essentials. As distributors we can no longer be content merely to satisfy the extensive demands for our products. We must, even in this difficult and often highly technical field, become the want creators that we should be. Despite the growth factors already cited, it is this extra, the creation of a new sale millions of times a year, that will help solve our economic problem on the road ahead.

Big Market in Modernization

There are 38,000,000 electrical residential customers who need home modernization through better wiring to take care of the increasing numbers of appliances they will use. There are vast numbers of factories, mills and plants that must be modernized electrically in order to compete in their own markets. And that means the much wider use of our products from lighting to distribution and wiring systems, motor applications and control, electronics, electric heat, air conditioning and scores of other applications of controlled electrical energy.

In the still bigger commercial market, in offices and stores of all descriptions, the same opportunity exists. Stores that are most attractive to customers will be most efficient competitively. Again that means millions of sales opportunities in the field of apparatus and supply products —in lighting, outlet boxes, switches, motor control, wiring, ad infinitum.

As representatives of the growth industry, we electrical men just cannot afford to grow at just the same rate as the rest of the economy. We are now face to face with the need, the responsibility, to spark our national economic growth and productive efficiency by creating new electrical wants and therefore new electrical sales. In only seventy electrifying years our industry has transformed the face of America both at home and at work. We can, we must, do it again—and faster!

We Have the Strength

If we fall prey to fears and weakness it is probably because we do not know our own strength. The United States is now the mainstay of the free world and our economic strength is our best safeguard of continued freedom.

The communist world—a very large one numerically—is waiting and hoping for a sign of major weakness in our economic structure. They will not see that sign because our dynamic and democratic system of free enterprise for profit will continue to expand and grow stronger through intensified selling of a better way of life. We have always bought that and we always will.

In this great future that stretches out along the road ahead, the electrical distributor will do his full part in building the Electrical Age which, even now, is still in its infancy.

WASHINGTON COMMENT

JESSE MOCK

Elaborate plans, reports, and programs are coming off the government printing presses at a rapid clip during these last days of the Truman administration.

With few exceptions these dying gasps of a departing administration paint a glowing picture of what life would be like if the Democrats continued to hold sway. One expensively illustrated booklet, printed at government expense, draws in broad strokes a 500-kv transmission system covering some 22 western states. Another tells of a proposed $2.1 billion reclamation program which would add another 2.5 million kw of generating capacity for the western states.

The Democrats Write a Platform for 1956

From Tennessee Valley Authority there is a call for government expenditures totalling $1 billion over the next five years to add 3.7 million kw of steam generating capacity to that government system.

Truman Budget a Campaign Platform . . . The Truman budget gives the overall picture of the Democratic proposals. It is the nearest thing to a brand new campaign platform that is possible from the party leadership still holding the top government posts.

There is a strong urge to toss these documents into the nearest wastebasket. After all, they have been put together by a defeated and discredited administration. Nobody expects a major portion of these policies and plans to be approved or adopted by the incoming Republican Administration and the new Republican Congress.

It may be well, however, to take another look at them before filing them away. Their value as blueprints for the future is certainly dubious. But as political strategy, they merit a second look.

As the Republicans well know, it is extremely difficult for a minority political party to have the sort of recognized leadership and party discipline needed to win national elections. For the majority party, the White House offers both the leadership and the means to exert the discipline that is needed. Through its patronage, policies, and expenditures, the White House has the power that spells both leadership and discipline. Both these factors are particularly important in keeping the various factions of the party together in nation-wide political campaigns.

It's Easier to Stay in Than Get in . . . The party in power also has the resources of the federal government at its command to help write the public policies and programs that help it stay in power. By comparison, the minority party must depend on the relatively insignificant research staff which its national committee can muster at campaign time. With government in this country as big as it now is, these advantages enjoyed by the majority party makes it increasingly difficult for the party to be deposed.

The Democrats realize this although they have not had to cope with the problem as the Republicans have. Thus the Democrats are attempting to make the utmost use of the White House before turning it over to the Republicans.

The Democrats have used the resources of the federal government to spell out the sort of plans and programs which they believe will appeal to the voter who turned them down last Nov. 4. They have put these plans together while they still have the recognized leadership represented by the White House. True, the discipline of the minority party has dwindled since the election, but it is probably stronger now than it will be until another election rolls around.

These policies, plans, and programs give the Democrats a rallying point from which to launch their opposition both in Congress and in other public forums. Unless the Republicans come forward with more attractive programs, these heirlooms of the Truman Administration may assume more importance than they would seem to merit.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Undesirable relaying action is occasionally to blame for a transmission line outage. This calls for regular inspection and testing.

Lightning is 10 times as prolific in causing transmission outages as any other single factor.

At 2050 psi 1050/1050 F reheat **heat absorbed** is 39.3% in the primary superheater and 43.6% in the reheater—together 93% of the total absorption.

Reclosure of line breakers has shifted the attention to permanent faults—the temporary ones are overridden.

Turbine lubricating oil makeup usually runs between 7 and 12% of the total oil in the system.

High-pressure high-velocity hydrogen promises to do all that liquid cooling could do for alternators and with much less complexity.

Sediment, flash-and-fire, corrosion and color tests for turbine lubricating oil have largely been superseded by neutralization number, viscosity, steam emulsion number, interfacial tension and gravity tests.

Stainless steel needs cathodic protection when buried. Its chromium, nickel, columbium, carbon and iron participate with weld metal (or surface contamination) in surface galvanic cells that are electrolytically destructive.

Auxiliary-power transformers in power plants may or may not be reached by outside surges. It depends on the impedance of the path.

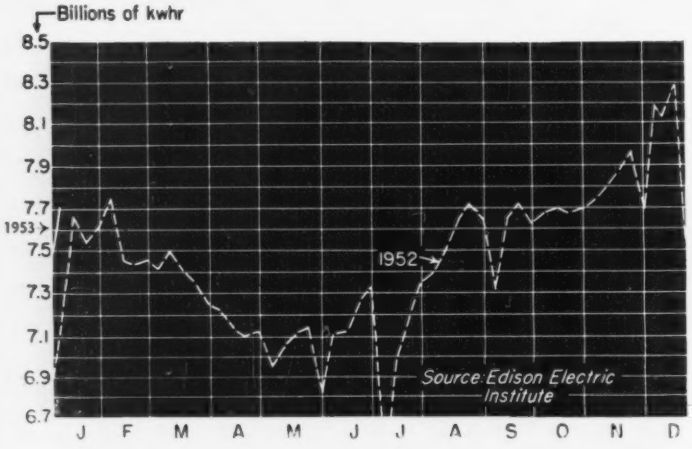
Water required to mature cereals and crops runs from 20 to 36 tons per bushel.

Performance of transformer windings under surge conditions is considerably improved by applying shielding for a few coils adjacent to the terminals.

Maintenance, wear and tear, service degradation are all less on a unit that is kept functioning at rated load. Peak and intermittent use are adverse.

Polyphase watthour meters are given a single-phase test (element current coils in series) by four out of five utilities.

STATISTICS



Output Week Ended Jan. 3—7,713,155,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Jan. 3	+7.9	+12.7	+6.4	+9.6	+7.8	+16.9	+4.1	+5.4	−11.5	+4.5
Dec. 27	+9.1	+8.9	+6.8	+10.8	+10.9	+12.8	+11.8	+9.9	−5.7	+9.1
Dec. 20	+5.8	+6.8	+3.0	+7.2	+6.2	+9.9	+3.9	+5.7	−7.7	+10.5

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Sept.	69.7*	69.7	64.7
Capacity (Million Kw)	Oct.	79.70	78.78	74.68
Production (Billion Kwhr)	Oct.	34.82	33.38	32.44
Hydro		7.02	7.36	7.55
Fuel		27.80	26.02	24.89
Fuel Consumption				
Coal (Million Tons)	Oct.	9.92	8.82	9.59
Oil (Million Barrels)		7.16	6.03	5.46
Gas (Billion Cu Ft)		83.08	97.37	71.74
Sales (Billion Kwhr)	Oct.	30.15	30.11	27.68
Residential		7.72	7.66	6.85
Commercial		5.09	5.37	4.65
Industrial		15.16	14.75	14.13
Other		2.17	2.33	2.05
Net Income Class A & B Companies ($ Million)	Oct.	53.67	73.12	65.47
Estimated Dec. 52 Peak (Million Kw)	Sept.	79.7	80.0	80.3
Kwhr per Residential Customer (12 Month Average)	Sept.	2,131	2,119	1,961
Revenue per Kwhr Residential Service (12 Month Average)	Sept.	2.77¢	2.77¢	2.83¢
Canadian Production (Billion Kwhr)	Oct.	5.42	4.99	4.92

Business Statistics

FRB Industrial Production Index ††	Nov.	230	231	220
Gross National Product Annual Rate ($ Billion)	3rd Qtr.	343.4	342.6	337.1
E. W. 5 Industry Production Index	Nov.	128.3	127.4	122.1
ENR Construction Cost Index ††	Dec.	123.2	123.4	114.8
BLS Consumer's Price Index	Oct.	190.9	190.8	187.4
NEMA Insulation Materials Sales Index†	Oct.	599	531	559
NEMA Electric Appliance Sales Index†	Oct.	260	231	305
NEMA Household Refrig. Sales Index†	Oct.	122	136	113
Metal Prices, (Jan. 6)				
Copper, Conn. V., lb		$.24½	$ .24½	$ .24½
Lead, N. Y., lb		.14¾	.14¼	.19
Zinc, prime Western E. St. Louis, lb		.13	.12½	.19½
Tin, Straits, qual. N. Y. lb		1.21½	1.21½	1.03
Aluminum, ingot, base price		.20	.20	.19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. †1936=100 ††1949=100 ††† 1937-39=100 (Unadjusted)

How Many Households and Families in 1960?

Up-to-date projections of the number of households and families have just been released by the Bureau of the Census.

Growth in the number of households or families during the present decade will, the Bureau points out, depend partly on growth of the adult population. Since most of the persons who will marry and establish new families during the 1950's were born during the depression years of the 1930's when birth rates were unusually low, the number of new families formed by couples who marry during the present decade is expected to be smaller than the number formed by couples who married during the 1940's.

At the same time, the increasing average length of life and the growing tendency for older persons to be financially independent have had the effect of increasing the number of older persons who continue to maintain their own household.

The high medium and low series of projections for 1955 and 1960 reflect a range of variation in the factors which influence family formation. These estimates are not intended to show the limits under extreme circumstances such as full military mobilization or severe and protracted economic depression.

Projections of the Number of Family Units—Thousands

	Households	Married Couples	Families
July 1955			
High	48,401	38,446	42,940
Medium	47,701	37,798	42,240
Low	46,611	37,120	41,503
July 1960			
High	52,402	41,286	46,158
Medium	50,822	39,886	44,616
Low	47,985	38,356	42,682

Number of Family Units—Thousands

	Households	Married Couples	Families
April 1930	29,905	25,174	27,980
April 1940	34,949	28,517	32,166
April 1947	39,138	33,406	36,240
April 1948	40,720	34,289	37,280
April 1949	42,107	35,323	38,537
March 1950	43,468	35,925	39,193
April 1951	44,564	35,998	39,822
April 1952	45,464	36,510	40,442

Accounting Treatment of Accelerated Amortization by State Public Service Commissions

Indiana—Indiana & Michigan Electric 10/7/52

• During the period of amortization of such emergency facilities, charge to "Provision for Deferred Federal Income Taxes" and credit to "Appropriated Surplus Arising from Deferment of Federal Income Taxes" an amount or amounts in total for each year equal to the reduction in federal income taxes arising out of special amortization, as provided in Section 124A of the Internal Revenue Code, in excess of the reduction resulting from normal income tax depreciation of the cost of such facilities.

• After the expiration of the effective amortization period and until "Appropriated Surplus Arising from Deferment of Federal Income Taxes," applicable to specific facilities is exhausted or such facilities are retired from service, charge "Appropriated Surplus arising from Deferment of Federal Income Taxes" and credit "Portion of Current Federal Income Taxes Deferred in Prior Years" with amounts equal to the increase in federal taxes on income resulting from depreciation on the emergency facilities no longer being available for federal income tax purposes.

Michigan—Indiana & Michigan Electric 10/17/52

• During the period of amortization of such emergency defense facilities charge to "Provision for Deferred Federal Income Taxes," and credit to "Appropriated Surplus Arising from Deferment of Federal Income Taxes" an amount or amounts in total for each year equal to the reduction in federal income taxes arising out of special amortization as provided in Section 124A of the Internal Revenue Code, in excess of the reduction resulting from normal income tax depreciation of the cost of such facilities.

• After such amortization under each necessity certificate is completed, or is discontinued by the company, and thereafter during the life of such property, or until the earlier exhaustion of the portion of the "Appropriated Surplus Arising from Deferment of Federal Income Taxes" related to such property: 1. To charge to "Appropriated Surplus Arising from Deferment of Federal Income Taxes," and to credit to "Portion of Current Federal Income Taxes Deferred in Prior Years" an amount or amounts in total for each year for necessity certificates equal to the increase in the federal income taxes payable for that year, due to the fact that normal depreciation cannot be deducted because of previous amortization of the property under such necessity certificates, and
2. To charge to "Appropriated Surplus Arising from Deferment of Federal Income Taxes" and credit to "Portion of Current Federal Income Taxes Deferred in Prior Years" an amount or amounts equal to any balance in said reserve at Dec. 31 of each year for plant retired during said year, which had been amortized under such necessity certificates.

For earlier accelerated amortization orders see Page 42, October 13, 1952 issue of Electrical World

Florida—Gulf Power Co 9/12/52

• During the period in which the amortization of emergency facilities results in reduction of federal income taxes, to charge to "Provision for Deferred Federal Income Taxes," as a subaccount under Account 507, taxes, and concurrently to credit to "Earned Surplus Restricted for Future Federal Income Taxes," as a separate account under Account 271, earned surplus, an amount equal to the reduction in federal income taxes resulting from accelerated amortization in excess of normal depreciation allowable for federal income tax purposes.

• During the period in which the accelerated amortization of emergency facilities results in increased federal income taxes, to charge to "Earned Surplus Restricted for Future Federal Income Taxes" and concurrently to credit to "Current Federal Income Taxes Deferred in Prior Years," a subaccount under Account 507, taxes, an amount equal to such increase in federal income taxes, such charges and credits to be made until such restricted surplus is exhausted.

Virginia—Applachian Electric Power Co 11/25/52

• During any period of accelerated amortization of the portion of costs of emergency facilities certified pursuant to said Section 124A of the Internal Revenue Code, to provide currently by charge to "Provision for Future Federal Income Taxes" and currently credit "Earned Surplus Restricted for Future Federal Taxes on Income" amounts equal to the reduction in federal taxes on income resulting from the accelerated amortization of such facilities for federal income tax purposes.

• After the expiration of the effective amortization period and until "Earned Surplus Restricted for Future Federal Taxes on Income" applicable to specific facilities is exhausted, or such facilities are retired from service, charge "Earned Surplus Restricted for Future Federal Taxes on Income" and credit "Current Federal Income Taxes Deferred in Prior Years" with amounts equal to the increase in federal taxes on income resulting from depreciation on the emergency facilities no longer being available for federal income tax purposes.

REGULATION

Appalachian Electric Power Co has received Virginia State Corporation Commission approval to increase rates $1.7 million a year effective Feb. 1 . . . **Florida Power Corp** has asked the Florida Railroad and Public Utility Commission approval to increase rates. Company did not ask for any "specific increase in any classification of rates, but did ask they be permitted to put into effect a uniform schedule of rates sufficient to yield a fair rate of return upon the value of property devoted to the public's use or to modify existing rates as will insure that result." The commission has set no date for a hearing on the petition.

Hamilton, Ontario, has increased rates 20.7% effective Jan. 1. A. W. Bradt, general manager of the Ontario Hydro-Electric System, said that the cost of power supplied by Ontario Hydro to Hamilton has risen by

20.7% and the Hamilton hydro system is passing only that increased cost on to the consumer . . . **New York Public Service Commission** has ordered hearings on a New York City's Board of Transportation complaint that new rates charged by Consolidated Edison Co of New York and placed into effect recently will increase power costs for the subways by $2,782,800 a year. Con Ed said that, based on 1951 operations, the increase would be $2,665,000 a year.

FINANCIAL BRIEFS

Over 93% of the outstanding shares of Class A stock of Niagara Mohawk Power Corp has been converted into common stock, Earle J. Machold, president, has announced . . . **Consolidated Edison Co of New York** has absorbed its subsidiary, Staten Island Edison Corp . . . **Community Public Service Co** has received Federal Power Commission approval to issue a common stock dividend at the rate of one share for each five shares held . . . **Delaware Power & Light Co** plans to spend $16 million in 1953 for construction.

New Suit Filed by PUD to Block Puget Power Sale

Kitsap County PUD, Olympia, Wash., has initiated another court action in its attempt to block the sale of Puget Sound Power & Light Co properties to five other PUD's.

Filed in Thurston County Superior Court at Olympia, the new suit seeks to enjoin the Thurston PUD from participating in the purchase, either by issuance of bonds or other action.

J. W. Bryan and C. E. Ferguson, Kitsap PUD commissioners, assert that the Thurston PUD plans two bond issues, one for $10 million to acquire Puget Power's distribution system in Thurston County and another for $16 million to gain a 20% share in remaining Puget Power properties, including Kitsap County distribution lines. They contend that Thurston PUD lacks authority to acquire electric properties in Kitsap County without consent of Kitsap PUD, which "does not consent to such acquisition." They further charge that the state law under which the proposed joint purchase would be made is unconstitutional.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
Dec. 31	**2.99**	**3.03**	**3.14**	**4.06**	**4.22**	**4.59**	**4.98**	**5.33**	**5.62**
Dec. 24	2.97	3.01	3.12	4.05	4.23	4.59	5.01	5.35	5.62
4th 1952	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
3rd 1952	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47

Data: Reis & Chandler, Inc.

EARNINGS

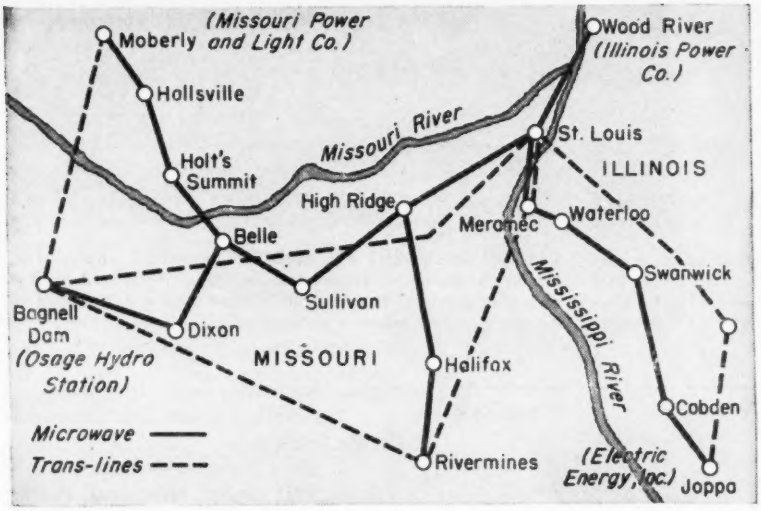
Company	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
Alabama Power consolidated	12	Nov.	$11,624,958	$10,685,448	$....	$....
Arizona Public Service	12	Nov.	3,163,635	1,814,654	....	....
Arkansas Power & Light	12	Nov.	6,011,150(a)	4,624,768	....	....
Atlantic City Electric	12	Nov.	2,767,819	2,465,275	1.82	1.69
California Oregon Power	12	Nov.	2,601,682	2,378,634	....	....
Consolidated Gas, EL&P of Baltimore	11	Nov.	8,891,525	8,097,906	1.58	1.45
Consumers Power	12	Nov.	20,229,474	19,824,920	2.73	2.66
Dallas Power & Light	12	Nov.	4,187,313	3,358,446	....	....
Detroit Edison	12	Nov.	16,599,716	15,246,251	1.65(b)	1.68(b)
Georgia Power	12	Nov.	12,048,657	9,087,076	....	....
Gulf Power	12	Nov.	1,752,973	1,170,420	....	....
Houston Lighting & Power	12	Nov.	8,730,844	6,522,445	....	....
Iowa Southern Utilities	12	Nov.	1,049,252	773,629	1.49(c)	1.30(c)
Kansas City Power & Light	12	Nov.	5,757,596	4,348,420	....	....
Louisiana Power & Light	12	Nov.	3,089,691(e)	2,528,893	....	....
Mississippi Power	12	Nov.	1,946,320	1,855,729	....	....
Mississippi Power & Light	12	Nov.	3,749,139(f)	2,985,460	....	....
Public Utility District No. 1 of Lewis County	12	Oct.	512,056(g)	461,036	....	....
Southern Co. consolidated	12	Nov.	20,263,204	16,231,553	1.18(h)	0.99(h)
Tampa Electric	12	Nov.	2,247,492	1,742,766	3.42(i)	2.91(i)
Texas Electric Service	12	Nov.	8,244,720	6,445,881	....	....
Texas Power & Light	12	Nov.	7,371,373	6,105,296	....	....
Virginia Electric & Power	12	Nov.	10,957,037(k)	9,365,364	1.79(j)	1.72(j)

Notes—(a) Excluding $530,806 tax saving on fast amortization; (b) Based on 10,043,778 shares in 1952 and 9,081,483 shares in 1951; (c) Based on 581,583 shares in 1952 and 479,331 shares in 1951; (e) Excluding $273,059 tax saving on fast amortization; (f) Excluding $466,238 tax saving on fast amortization; (g) Net operating revenues; (h) Based on 17,076,669 shares in 1952 and 16,306,494 shares in 1951; (i) Based on 626,776 shares in 1952 and 598,441 shares in 1951; (j) Based on 5,194,227 shares in 1952 and 4,721,916 shares in 1951; and (k) After extraordinary federal income tax reduction of $340,400 due to fast amortization.

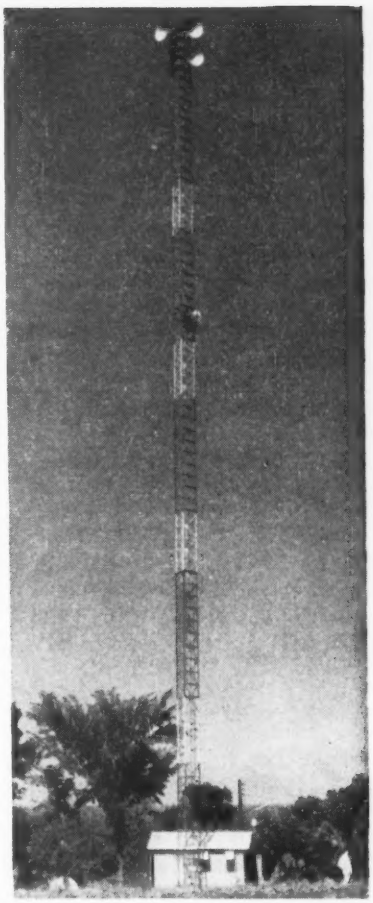
FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
SCHEDULE FOR JANUARY—FEBRUARY			
Bonds			
Kansas City Power & Light—1st mtg.	$12,000	.....	Jan. 19
Ohio Power—1st mtg.	22,000	.....	Jan. 20
Iowa-Illinois Gas & Electric—1st mtg.	8,000	.....	Jan. 27
Jacksonville, Fla., electric system	18,000	.....	Feb. 3
Iowa Southern Utilities—1st mtg.	7,000	.....	.....
Preferred Stock			
Ohio Edison—150,000 sh $100 par	$15,000	.....	Jan. 13
Ohio Power—100,000 sh $100 par	10,000	.....	Jan. 20
Iowa-Illinois Gas & Electric—60,000 sh $100 par	6,000	.....	Jan. 27
Common Stock			
Southern California Edison—500,000 sh	.....	.....	Jan. 14
Toledo Edison—600,000 sh	.....	.....	Jan. 14
Ohio Edison—479,846 sh (being offered to commonholders on 1-for-10 basis, record Jan. 8 to expire Jan. 23; stockholders are allowed oversubscription privileges)	16,915	$35.25	6.24%
Consumers Power—617,669 sh (to be offered commonholders on 1-for-10 basis, record Jan. 15 to expire Jan. 30; company will name the subscription price)	.....	.....	Jan. 14#
Southwestern Public Service—about 293,500 sh (to be offered to commonholders on 1-for-12 basis; stockholders will be allowed oversubscription privileges)	.....	.....	.....
West Penn Electric—264,000 sh (to be offered commonholders on 1-for-15 basis, record about Jan. 23 to expire about Feb. 9; company will name subscription price)	.....	.....	Jan. 21#
UNSCHEDULED AND UNDER CONSIDERATION			
Bonds			
Central Maine Power—1st general mtg.	$10,000	.....	.....
Toledo Edison—1st mtg.	7,500	.....	.....
Rockland Light & Power—1st mtg.	5,500	.....	.....
Southwestern Public Service—1st mtg.	12,000	.....	.....

Notes—# Date of competitive bids of purchase of any unsubscribed shares.



UNION ELECTRIC COMPANY'S MICROWAVE SYSTEM covers 425 miles in three directions from St. Louis Control Center. Wood River beam ties to Illinois Power microwave. Meramec beam extends to Electric Energy, Inc. and ties to Central Illinois Public Service. Third beam serves Rivermines transmission substation, Osage Hydro station, and Missouri Power & Light interconnection at Moberly. Circles indicate microwave installations.



RELAY STATIONS have 100 to 250 foot towers at high points 11 to 37 miles apart. Building at base houses electronic equipment, photo cells for tower lights, and automatic gas-powered emergency generator

Microwave Relieves Our Overloaded Circuits

Union Electric's Microwave, supplemented by VHF radio systems offers adequate and reliable facilities with maximum flexibility for future growth and at minimum cost

GEORGE W. FOX, Electrical Engineer, Union Electric Co of Missouri, St. Louis

M. G. STATON, Product Manager, Microwave & Channeling Section, Radio Corp of America, Camden, N. J.

Maximum dependability, even under the most adverse conditions, is predicted for the microwave-VHF radio communications system which is now nearing completion by Union Electric Co. Central control points for the network are located at the St. Louis, Osage, and Rivermines terminals.

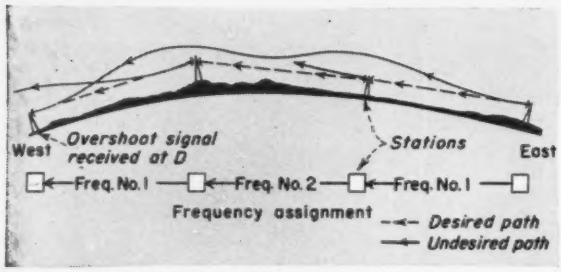
An alarm panel, equipped with blinker lights, will flash the location of trouble anywhere on the system and will indicate the cause of the trouble. The electronic equipment at all locations is backed up by duplicate transmitters and receivers so that in case the normal equipment fails, the standby unit automatically goes into service.

Need More Facilities . . . Development of the new microwave and VHF space radio system for the company's power system operation was prompted by the growing feeling that existing communications facilities fell far short of meeting the requirements. The objective in developing the new communications facilities was to have a system that would not only meet the most exacting demands that might be imposed upon it by load dispatching and other essential operating functions but would also bring about the closest possible coordination between personnel at outlying stations and offices, the field crews, and the executive and service personnel throughout the territory served.

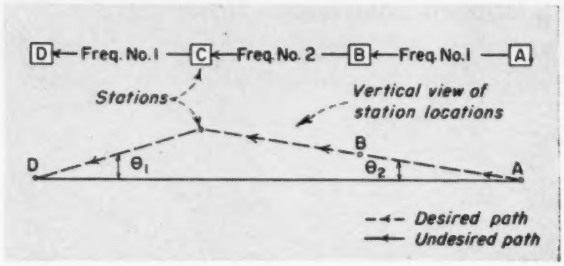
Studies for the rehabilitation and enlargement of the communications facilities were started just prior to World War II and were renewed in 1946. At that time both leased wire services and power-line carrier were being used. Traffic density studies indicated that facilities were badly overloaded. On the average one might expect to get a busy signal 49% of the time on the power-line carrier current circuits and anywhere from 32.4 to 41% of the time on the leased wire line services.

A study of power-line carrier circuits for a typical work week showed almost constant usage. These studies were made with a recording voltmeter connected to the carrier sets. They confirmed the belief that there was dire need for expanded communications facilities.

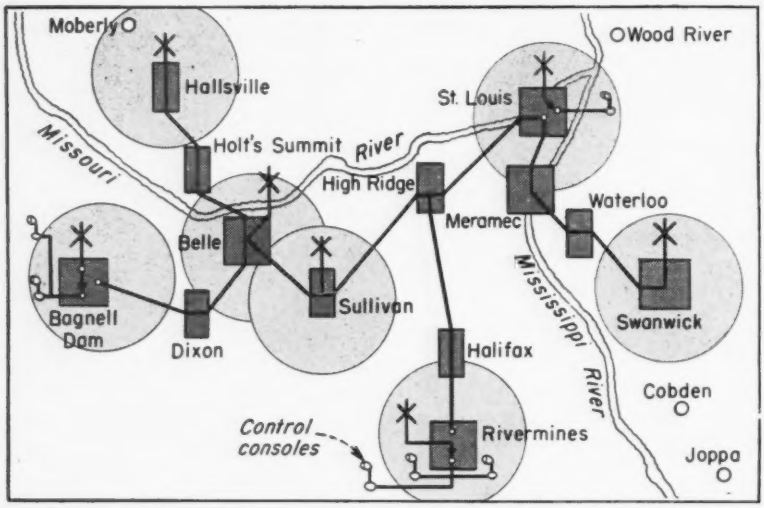
Study Possibilities . . . Various methods of expanding communications



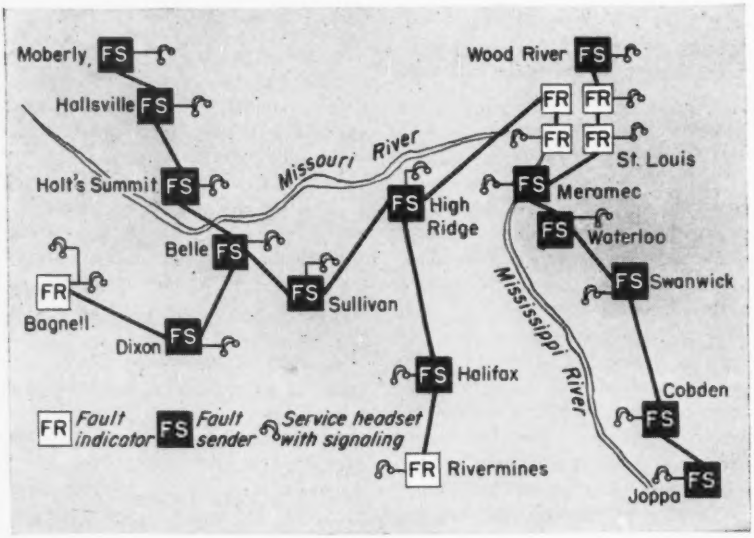
OVERSHOOT MAY OCCUR when atmospheric conditions cause wave to skip over the receiver for which it was intended, then deflect back into its normal position and be received at a more distant station tuned to the same frequency. This phenomenon is called "overshoot"



STATION LOCATIONS ARE SELECTED to avoid a straight line, thereby eliminating interference from overshoot. $\theta_1 + \theta_2$ must equal or exceed 24 degrees if four foot antennae are used at A and D, or 16 degrees if six foot antennae are used.



VHF BASE RADIO STATIONS ARE INCLUDED at many microwave installations, located to give space radio coverage of all major transmission lines and local load areas. All can be operated simultaneously from St. Louis, Bagnell Dam, or Rivermines. Individual operation at these points by local personnel also is provided



COMMUNICATION FOR MAINTENANCE PERSONNEL is provided by a special channel linking all microwave installations. This channel also serves to provide indications of the condition of the entire communication system to the control centers at St. Louis, Rivermines, and Bagnell Dam (Osage hydro station)

facilities were studied. They were

1. Additional wire line or leased line facilities.

2. More power-line carrier.

3. VHF space radio and microwave.

Wire line circuits built by the company would be high in first costs, and maintenance costs would be high. Leasing the required wire line facilities would involve high monthly rental charges. Also, because of the small conductor size and the relatively close spacing of conductors used in telephone construction, the hazards imposed by the elements is pronounced. Such communications systems are least available during storms when they are most needed. Additional channels over already existing circuits would be very limited, and the equipment would not fully meet the requirements because there is no communication coverage of areas between terminals.

Study of power-line carrier possibilities resulted in enumeration of advantages and disadvantages as follows:

Advantages

1. Well known and reliable.

2. Reasonable cost.

3. Unless distance between terminals is very great, usually over 200 miles, no repeaters are required.

4. Maintenance costs are low.

5. All equipment is located at terminal stations, on company's own property.

Disadvantages

1. Difficult to "crib" additional functions on an existing carrier channel.

2. Susceptible to condition of transmission line.

a. Sleet attenuates signal, reduces signal to noise ratio.

b. Switching, grounded, or broken conductors often result in loss of signal.

3. Carrier is used so extensively that addition of more channels becomes difficult because:

a. Frequency spectrum space is already crowded.

b. Difficulty of finding physical space in get away structures to add carrier components such as traps, capacitors, and other equipment.

4. Changes in configuration of transmission line usually requires changes in carrier system.

5. Carrier, like wire line facilities, lacks versatility and flexibility.

6. It does not meet the need for providing communications at intermediate points.

Communications System Requirements . . . With these things in mind it became apparent that the new communications system must:

1. Be reasonable in first cost.

2. Be easy to expand as future conditions require.

3. Have low cost for expansion.

4. Provide communication coverage for the major transmission lines and distribution networks.

5. Have physical separation from the transmission line circuits.

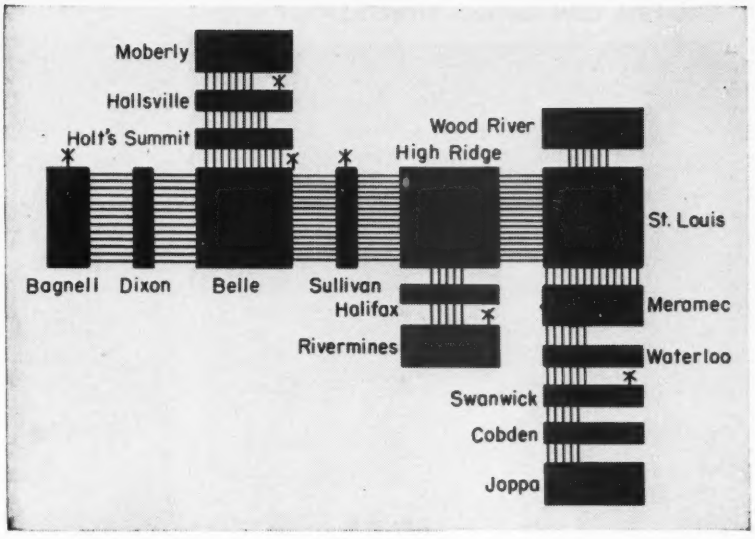
6. Be as reliable, or even more so, than power-line carrier.

7. Be free from whims of the weather.

After considerable study, it was determined that a combination of microwave and VHF space radio offered the best solution. Microwave links will connect St. Louis, Osage, Rivermines, and Moberly. VHF base radio stations, strategically located, will afford complete coverage of the major transmission line system.

RF Frequency Assignments . . . Two RF channels are required for this type of microwave system, one for each direction of transmission. The 2,000 mc equipment requires a spacing for the frequencies in each direction of transmission of 40 mc.

The Union Electric system operates on the principle of single sideband frequency division multiplexing with an FM final carrier. As a result, it is most efficient as regards frequency space requirements. The operational block, 1,850-1,990 mc, can be broken down into 12 RF channels which can be used for six two-way RF systems. With this particular type of equipment it is possible to operate six parallel two-way RF systems, each capable of carrying 24 voice channels between two points. One set of frequencies has been used for the Missouri system. It was necessary to use a second set of frequencies for the Illinois system because of the acute angle between the beams leaving the St. Louis terminal.



MANY CHANNELS ARE PROVIDED by the initial installation. By virtue of the multiplex system, all channels shown can be used simultaneously. Even the heaviest link is only 30% loaded, which leaves ample opportunity for subsequent expansion of the system

Polarize Antennas . . . It is possible for the antenna normally receiving signals from a station east to receive signals on the same frequency from a station west. This is known as back lobe pick up. It is also possible to have a signal reflected from a hill or a building in an undesired direction. To prevent this type of interference the antennas on the path to the stations west are horizontally polarized, and those on the adjacent path to the station east are vertically polarized. Antennas on the Union Electric system are so designed that they can be turned 90 deg. and such changes in polarization were made at the time the system was installed.

Voice Channels . . . The Union Electric system carries many kinds of voice and signal traffic. The most common types of voice channel facilities are ringdown, common battery, and dial. These channels can exist between telephone handsets, between switchboards and handsets, or between different types of switchboards.

There are channels for:

1. Operating between the manual board in St. Louis and the automatic equipment at Joppa.

2. Interconnection of voice channels on the Union Electric microwave system with channels on the Illinois Power Co microwave system.

3. Interconnection of the microwave with conventional wire line at Holts Summit.

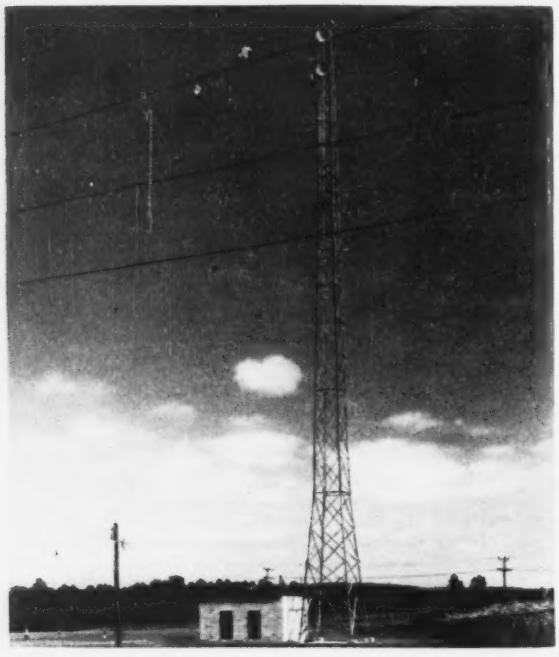
4. Interconnection of the microwave system with the high line carrier channel at Moberly, Mo.

One channel was set aside for maintenance personnel use. This channel becomes available at every station, regardless of whether it is a terminal, through repeater, or drop repeater. Pushbutton signaling facilities are available between all stations so that maintenance personnel can call or be called at any station.

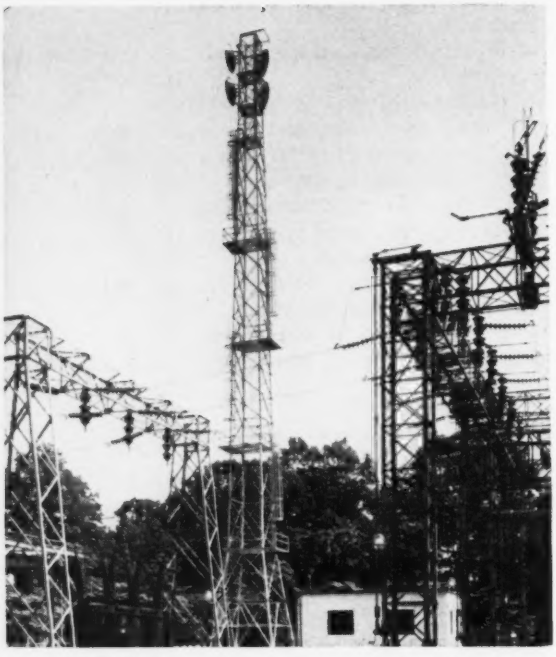
This service channel is also used to indicate communication system faults. Each repeater or unattended terminal station is equipped with a fault transmitter. Bagnell Dam and Rivermines are each equipped with a fault receiver or fault indicator. The St. Louis terminal is equipped with dual fault indicator facilities. Fault indicator units are installed at the radio equipment and at the dispatcher's console. Faults occurring at any unattended station are automatically indicated at all of the points which supervise the operating condition of the communication system.

Signal Channels . . . In addition to the various types of voice channels, there

(*Continued on page* 144)



MICROWAVE INSTALLATION at Windy Edge switching station has four 48-in. diameter antennas mounted at top of 150 ft tower



TOWER SUPPORTS 72-in. diameter antennas at Mays Chapel switching station. Installation is similar at Pumphrey switching station

Fault clearing, control, and communication . . .

Microwave Does All 3 in Baltimore

CHARLES WASSERMAN, Electrical Engineering Department, Consolidated Gas, Electric Light & Power Co of Baltimore

Microwave radio installations in conjunction with Consolidated's 110-kv transmission system has the primary purpose of obtaining high speed clearing of faults. It not only provides channels for protective relaying but additional channels for supervisory control, telemetering, load dispatcher telephones, remote control of vhf mobile radio-telephone base stations, and miscellaneous functions.

Frequency Selection . . . Selection of the 960-mc band was based on the availability of equipment for test purposes and the smaller probability of loss of signal over the path to be used as compared with higher frequency channels.

A 960-mc test channel was installed between Riverside generating station and Windy Edge substation. First year's test results indicated that this type of communication was suitable. Daily variation in signal attenuation was about 12 or 15 db. Charts of receiver AVC (automatic-volume-control) voltage obtained at the two stations indicated that the variation of received signal is due almost entirely to free-space attenuation. The pattern of daily variation is similar to that experienced with standard broadcast frequencies.

Provision for Reliability . . . Spare transmitter-receiver units have been installed at each station, and they can be remotely switched into service. The a-c supply to the microwave equipment is obtained through a three-unit motor-generator set, consisting of an a-c generator, an a-c motor, and a d-c motor/generator. Normally, the a-c motor drives the unit, the a-c generator equipped with a voltage regulator supplies the microwave equipment, and the d-c motor/generator provides floating service to the standby control battery. Upon loss of the a-c drive, a governor on the motor-generator shaft is set to automatically cause the d-c machine to drive the unit and maintain its speed within approximately 3%, thereby maintaining supply to the microwave equipment without interruption. A spare three-unit motor-generator set is installed at each station.

The equipment used is guaranteed for operation through 125 db loss. Since it was considered desirable to have a good margin between the actual average loss and the design guarantee, 72 in. antennas were installed wherever possible; and non-pressurized, low-loss, high-frequency antenna cable is used. For the equipment the over-all loss is approximately 90 db which is thought to provide a safe margin both for equipment deterioration and for variations in free space attenuation.

Various purchased associated equipments have been modified slightly. The changes provide greater reliability for protective purposes both by reducing

Adaptation from paper before Electrical Equipment Committee meeting of Edison Electric Institute at New York, N. Y.

time delay in operation and the probability of inadvertent operations.

A squelch circuit was installed on the microwave receiver to avoid improper operation of the audio-tone receivers upon loss of the microwave carrier transmission.

The audio-tone receivers were modified to obtain a "class A" amplifier in which all elements function when receiving a signal. This permits positive supervision of the circuit. Also, the output of this receiver is passed through an output transformer to a full-wave rectifier, thus permitting direct connection to the carrier receiver relay without resorting to an interposing relay.

Since the purchase of the original equipment, an electronically keyed audio-tone transmitter has become commercially available, thereby eliminating the need for additional interposing relays.

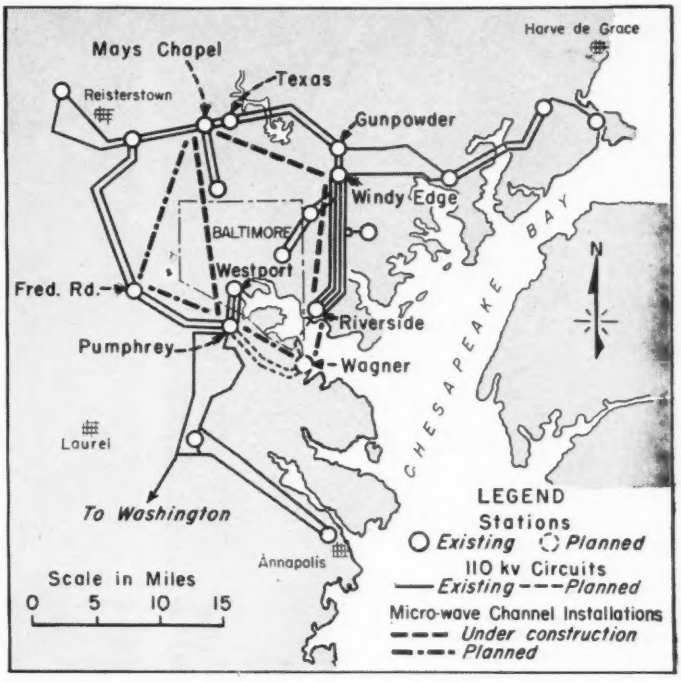
Windy Edge Installation . . . The microwave installation at Windy Edge station has two 48-in. antennas mounted at the top of a 150-ft tower and connected by ⅞ in. h-f cable to the transmitter-receivers in the building adjacent to the tower. This cable has a center copper conductor with spiralled polystyrene insulation and an extruded aluminum sheath. Its signal attenuation at 1,000 mc is approximately one db per 100 ft. Care is necessary in installation to avoid sharp bends and the introduction of filings within the interior of the cable. Terminal connectors had to be obtained on special order.

Equipment Locations . . . The permanent microwave equipment at Riverside station is in a penthouse on the boiler house roof which also supports the structure for the 72-in. antennas. Installations at Mays Chapel and Pumphrey stations are similar to Windy Edge except that the towers have been designed for 72-in. antennas and more convenient access to the antenna platforms.

At Windy Edge and Riverside stations, the multiplexing equipment and control panels for both microwave equipment and motor-generator sets are located in their respective station control houses. At Windy Edge the control house is 800 ft from the microwave equipment; at Riverside this distance is 1200 ft.

Mounted on the control panels are the various instruments for the supervision of the microwave transmitter power level, microwave received signal level, audio-tone receiver signals, and the motor-generator output. Means of initiating the audio-tone transmission and means of transferring operations to the spare transmitter-receiver unit or the alternate motor-generator set are also installed on these panels.

Transfer to the spare transmitter-receiver or the alternate motor-generator at unattended Mays Chapel and Pumphrey stations can be performed from attended stations by supervisory control. The multiplexing racks contain the audio-channeling equipment and the audio-tone transmitters, receivers, and associated equipment.



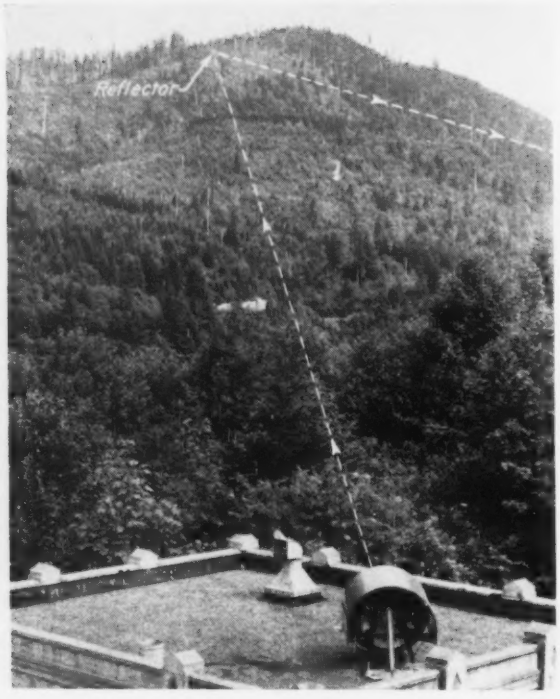
Baltimore's Transmission Ring and Microwave Radio Protection

Consolidated Gas, Electric Light & Power Co's 110-kv transmission system extends around the city of Baltimore. Planned extensions to the future Wagner generating station will close the loop. Circuits in the ring system are tapped to supply large blocks of radial load which reached a total of 217 Mva in 1951 and was 271 Mva for 1952.

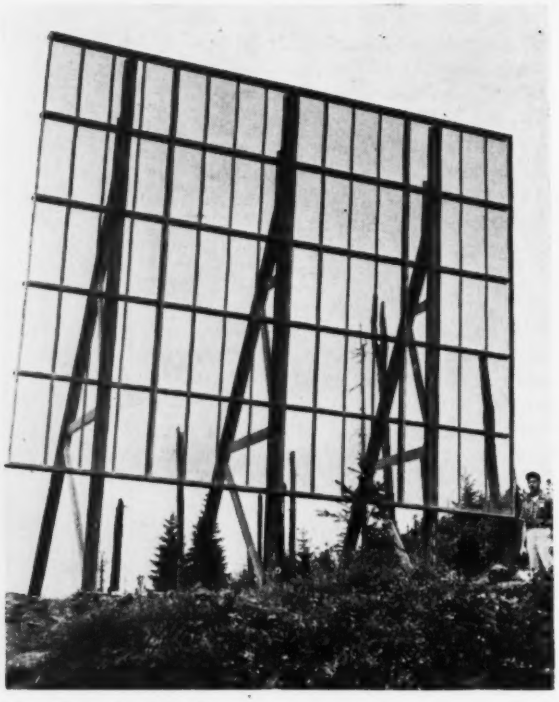
Basic relay protection of the lines between the 110-kv ring stations is obtained with directional impedance relays. Blocking signals transmitted between the line terminals restrain operation of these relays. If the directional relay elements indicate that a fault is within the protected zone, the blocking signals are interrupted and the associated breakers open without delay. If the fault is outside the protected zone, blocking signals keep their line section operating.

At various 110-kv stations radial loads are supplied through step-down transformers whose basic protection is obtained by means of differential relays which primarily control the operation of the low voltage breakers. Where feasible, these relays also initiate impulses which are transmitted via microwave radio to the distance terminal to open the breakers and deenergize the associated high voltage line.

Microwave (960 mc) equipment for circuit protection and other functions has been installed at Riverside generating station and three substations. Installations are planned for Wagner generating station and Fredrick Road substation.



From Merwin Plant . . .
Microwave antenna on terminal building sends signal to passive reflector located on top of mountain about 1,200 ft above antenna



Via Passive Reflector . . .
Aluminum framework mounted on concrete footings supports perforated aluminum screen. Reflector surface measures 20 by 24 ft

Microwave Links Hydroelectric

New Yale project of Pacific Power & Light Co will be controlled from Merwin Plant initially by five channels. Passive reflector takes beam in and out of valleys and around mountain

L. A. CARTER, Communications Engineer, Pacific Power & Light Co, Portland, Ore.

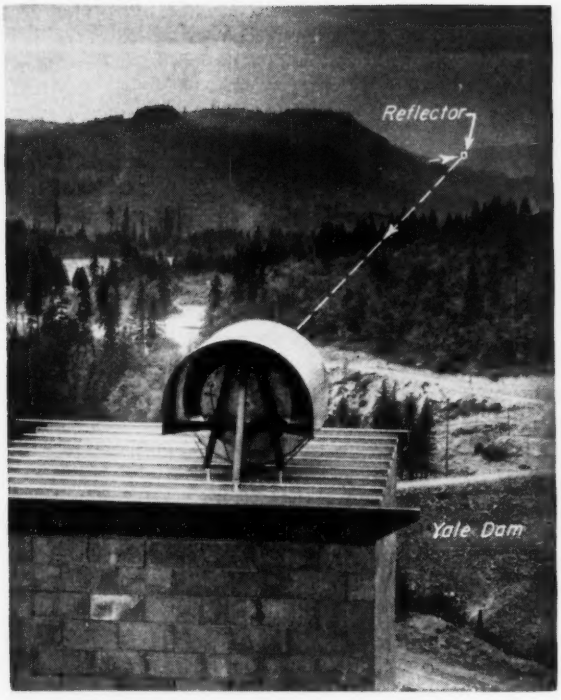
Microwave radio and a passive reflector will team up to link Pacific Power & Light Co's new 108,000-kw Yale hydroelectric project with the existing 100,000-kw Merwin hydro plant on the Lewis River in western Washington. The microwave installation will transmit control signals over about 11 miles of rugged, mountainous terrain. Modulations to be carried are voice, audio tones, and impulses for signalling, telemetering, and supervisory control.

Passive Reflector . . . The terrain and weather conditions in western Washington were factors definitely in favor of microwave as the means of communication between the two plants. However, a channel over intervening mountain ridges had to be provided between them. The parabolic reflector antenna at each terminal is mounted directly on the roof of the terminal building. The antenna at Merwin is at elevation 362, the Yale antenna at 637. A two-legged channel was established by mounting a passive reflector on a mountain top at elevation 1,557. The southern leg to Merwin is 1.36 miles long, and the eastern leg to Yale about 11 miles long.

Reflector surface is 20 x 24 ft. It consists of a perforated aluminum sheet mounted on an aluminum framework. Footings of the frame are set in concrete. Included angle between the incident and reflected waves at the reflector is 75 deg, 59 min. Total path attenuation is estimated to be 74.4 db. A calculated fading margin of about 25 db is provided. Minimum terrain clearance between the reflector and Yale is 104 ft above a 99-ft tree on a ridge about one-third the power distance from the terminal. The first fresnel zone clearance is 46 ft at this distance.

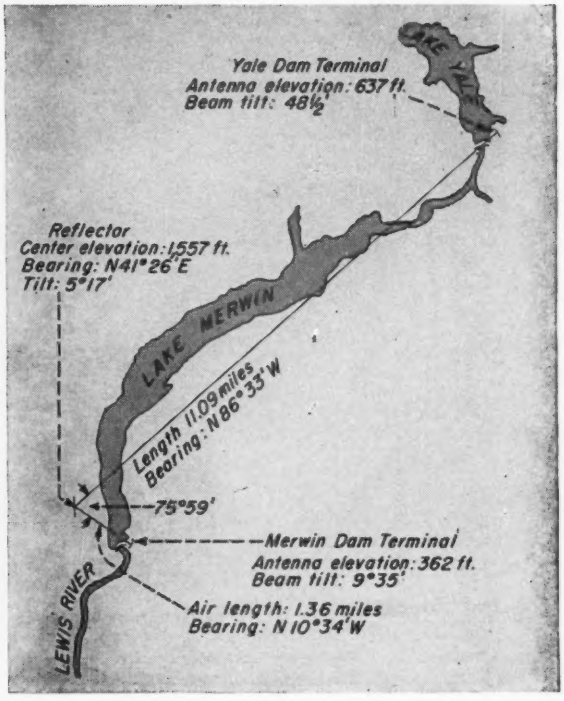
Terminal Connections . . . Frequencies to be used by PP&L are 6,705 mc at Yale and 6,585 mc at Merwin. Power permitted is 10 w; frequency tolerance is 0.05%. Yale terminal is being installed in a 10 x 12 x 8-ft concrete-block building located several hundred feet above the intake gates. Merwin terminal is being installed adjacent to the battery house at the switchyard about 100 ft above the dam crest. Microwave equipment at both Merwin and Yale are connected to channelizing equipment in their respective control houses through 26-pair communication cables.

Auxiliary power will be provided through 3-kw rotary inverters from the 130-v station batteries at each terminal



To Yale Project . . .

Microwave antenna atop terminal building is about 11 miles from reflector. Crest of nearly completed rock-fill dam is in foreground



Microwave Beam Bypasses Mountain . . .

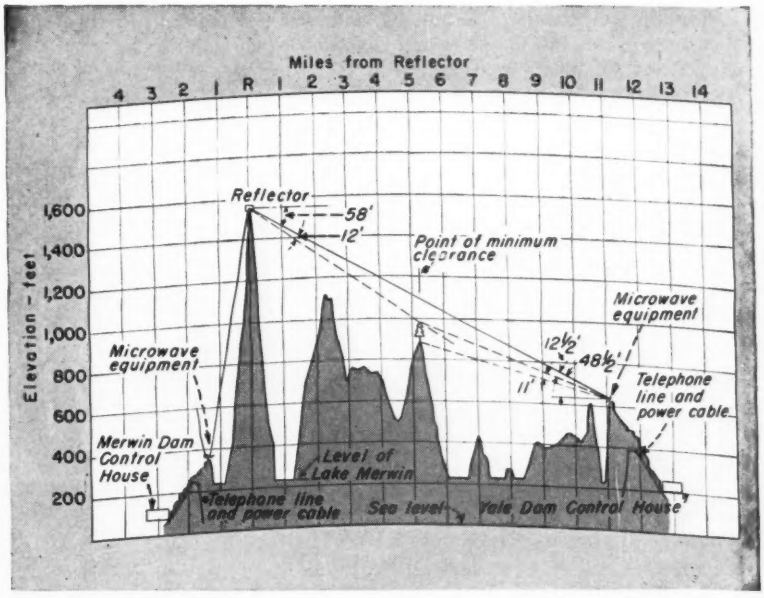
Communication by microwave was chosen over other means because of terrain and weather conditions found in western Washington

Plants in Pacific Northwest

if the normal source falls below 90 v for 3 sec. Normal source will be reconnected upon restoration of normal voltage for 10 minutes.

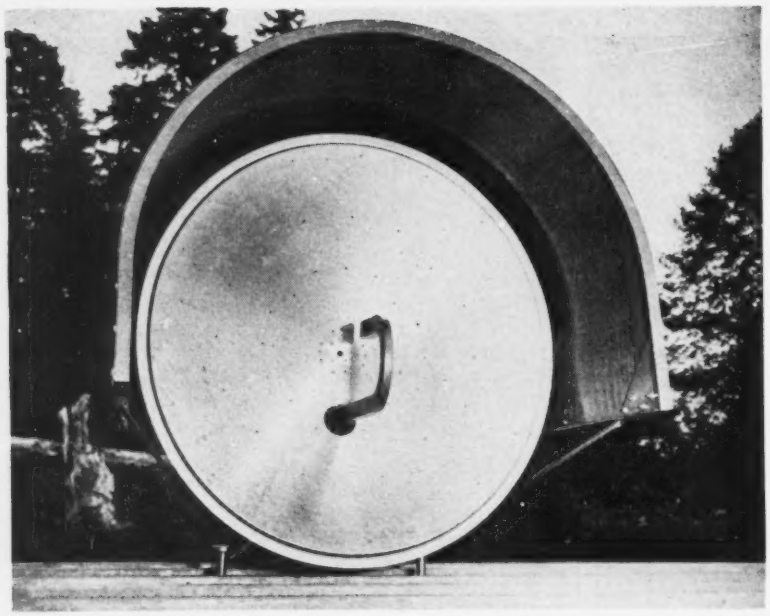
Five Channels Initially . . . Frequency division multiplexing is used in the initial installation to provide these services: Channel No. 1—a full duplex, 4-wire circuit for telemetering and supervisory control; Channel No. 2—a full duplex for an extension to Merwin from the PAX board at Yale; Channel No. 3—a full duplex circuit for subscribers' extension at Yale to the Woodland Telephone Exchange of West Coast Telephone Co; Channel No. 4—a full duplex extension from Yale to the magneto switchboard at Merwin; and Channel No. 5—a 4-wire emergency channel to be used if Channel No. 2 fails. Service sub-sets will be provided for testing on Channels No. 3 and 4.

Audio-frequency-tone channelizing of Channel No. 1 will transmit eight continuously telemetered quantities to



Terrain Clearance . . .

is at a minimum between the reflector and the Yale antenna above a 99-ft tree on a ridge about one-third the power distance from the terminal. At this point actual clearance is 104 ft; however, first fresnel zone clearance is 46 ft at this distance



Hooded Parabolic Antenna . . .

and transmitter-receiver feed into channelizing equipment in control house through 26-pair communication cable. Antennas are mounted directly on the roofs of terminal buildings

provide the Merwin operator with indications of total kwhr generated, generator kw and kvar, bus voltage, and excitation current for both units at Yale. Kilowatt indications for both units will be totalized at Merwin and re-transmitted to the recorder at the Portland dispatcher's office. Intermittent telemeter quantities to be selected by supervisory control are transformer temperatures, generator temperature, field voltage and wicket gate position for units No. 1 and 2. Supervisory indications will also be provided for oil circuit breaker positions and three alarms.

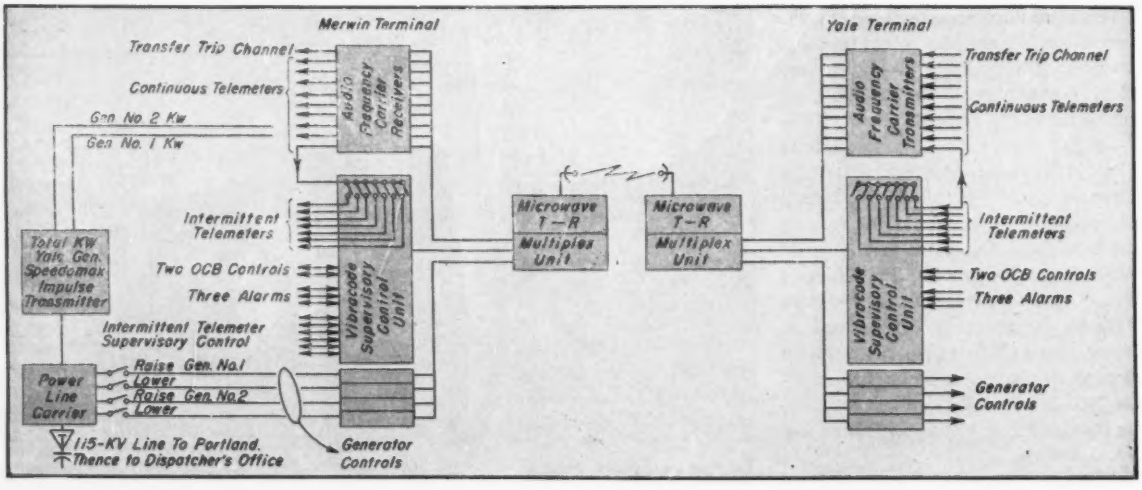
Supervisory control will be provided for "raise" and "lower" control of generator voltage. Continuous control of both Yale governors will be provided. Supervisory control is to be an all-tone device with complete check-back. Response time will be less than 1 sec. Selective telemeter indications are held until released manually or by transmission of an alarm signal.

Only half of the 18 possible audio frequency sub-carrier channels will be used initially. Yale governors may be controlled manually from Merwin. Governor control of either or both units may be switched to the frequency control impulses arriving at Merwin from the Portland dispatcher.

Duplicate radio-frequency equipment is provided in the event of failure of the primary units. Automatic switch-over will be indicated by alarms and lights at Yale and at Merwin. The operator at Merwin will also have an indication of switch-over to auxiliary power.

Transfer Tripping . . . A continuous transfer-trip microwave channel is being installed. Initially the channel will be used only to inform the Merwin operator that the Yale low-tension breakers have been opened by transformer differential relays. Experience at Merwin indicates that unit generator loads will track satisfactorily when on automatic control so that only occasional manual load trimming adjustments will be required. Provisions are made for the installation of proportional load control of the Yale units if necessary. Frequency control of the Merwin Plant from the Portland dispatcher's office will be extended to Yale by key switches to either or both units at Yale may be controlled.

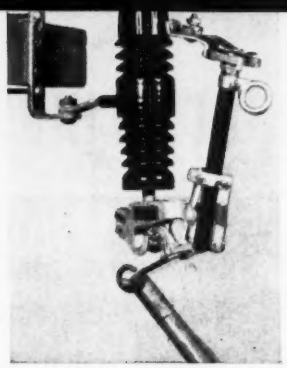
No high-tension oil circuit breaker will be provided at the Yale terminal of the 115-kv line to Merwin. Transformer differential-relay operation at Yale will clear the generator breakers, will ground one phase of the 115-kv line at Yale, and will transmit the trip alarm signal to Merwin.



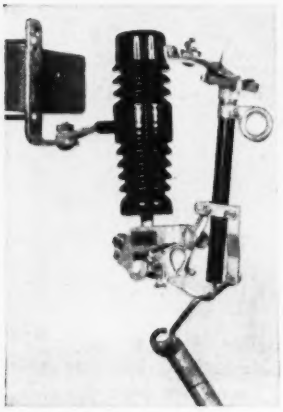
FIVE CHANNELS . . .

initially will transmit modulations of voice, telemetering and control impulses. Nine of 18 audio sub-carrier channels will be used at first

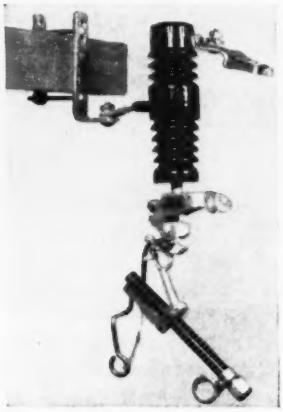
1 Fuseholder assembly showing how fuse-link cable passes over lever arm of load-break device.



2 Downward pull on switchstick inserted in hook-eye breaks fusible element of fuse link.



3 When fuse link breaks, the cutout interrupts load current as it would interrupt a low fault current.



4 After current interruption, fuseholder drops open removing itself from the circuit.

New G-E Load-break Cutout provides easy low-cost load switching . . . sectionalizing

Liberal design of G-E cutouts permits simple load-break device

General Electric's Open Dropout Fuse Cutouts—7.8 kv and 15 kv, 100-ampere ratings—now feature an optional load-break device. With it, you can switch loads or sectionalize your distribution circuits with but little increase in your cutout investment.

Fast, safer switching. The new load-break device operates by breaking the fusible element of the fuse link ***with arc-interruption occurring inside the fuseholder tube.*** It provides fast, safer switching of either inductive or capacitive load currents up to the 100-ampere continuous rating of the cutout. By substituting load-break fuseholders for conventional fuseholders—both 2000-ampere and 5000-ampere ratings—cutouts already in service are converted to load-break operation.

Liberal design of G-E cutouts for full-range current interruption makes them ideal for breaking load currents. It also permits an extremely simple load-break device that consists only of a stainless steel lever arm coupled to the cutout fuseholder. The load-break device has no awkward protrusions or parts to stick, bind or otherwise interfere with the dropout action of the cutout. And it does not interfere with fusing or inserting and removing the fuseholder by switchstick.

For more information on this, and other cutouts, write to *General Electric Company, Schenectady 5, New York.*

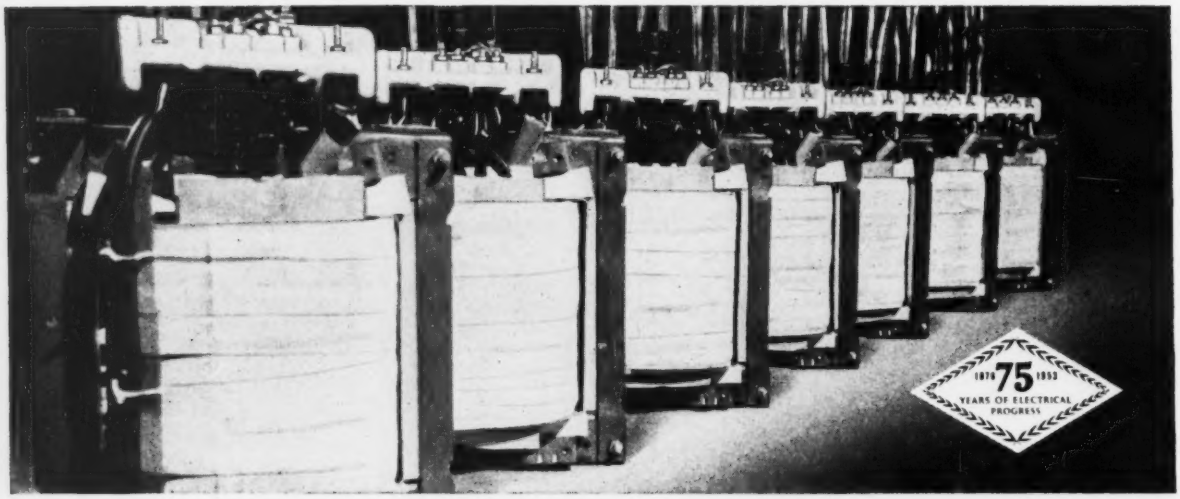
406-45

G-E OPEN DROPOUT FUSE CUTOUTS OFFER YOU MANY UNIQUE "EXTRAS"

- "Birdproof construction" eliminates unnecessary fuse blowing.
- Close coupling of fuseholder to insulator, plus shock absorbers, reduces recoil stresses.
- Sealed upper end on fuseholder excludes water and controls expulsion gases.
- "Hinge guides" eliminate side-sway, provide positive contact engagement.
- Interchangeable standard and heavy-duty fuseholders — 2000-amp. and 5000-amp. interrupting ratings.

GENERAL ELECTRIC

Get new transformer performance with



G-E Spirakore Universal replacement core-and-coils

Here's the simple, easy way to restore your small burned-out distribution transformers of any make to "active" life for many more years of service. Simply install General Electric universal replacement core-and-coils of the famous Spirakore design (3 to 25 kva).

About ⅔rds the Cost of a New Transformer. By the use of G-E replacement core-and-coils, your old transformers can be restored "good as new" at substantial savings. You can also up-rate your present 1½ and 3-kva transformers to 3 or 5 kva, in some cases 7½ or 10 kva, depending on tank dimensions. In addition, 2400-volt transformers in steel tanks may also be changed to 7200 volts with new core-and-coils and new high-voltage bushings.

Advantage of Modern Design. G-E replacement core-and-coils incorporate all of the design advantages inherent in the latest manufacturing practices, such as:

- High insulation strength, 60-cycles and impulse
- Liberal design, resulting in conservative operating temperatures
- Uniform electrical characteristics with low losses and excellent voltage regulation. Low exciting current
- Modern voltages and taps

Guarantee. G-E replacement core-and-coils carry the same guarantee as new transformers. They are supplied with a nameplate bearing a new serial number for attachment to rebuilt transformers.

Your transformers can be repaired at your nearest G-E Apparatus Service Shop, where trained personnel and special equipment is available for prompt service, or they can be renewed in your own shop.

Call your nearest G-E sales office or G-E Service Shop, or write for additional information on replacement core-and-coils. Address Sec. 431-1, General Electric Company, Schenectady 5, New York.

*Registered trade mark of General Electric Company

Typical G-E Service Shop operations in up-rating a 3-kva transformer to 5 kva

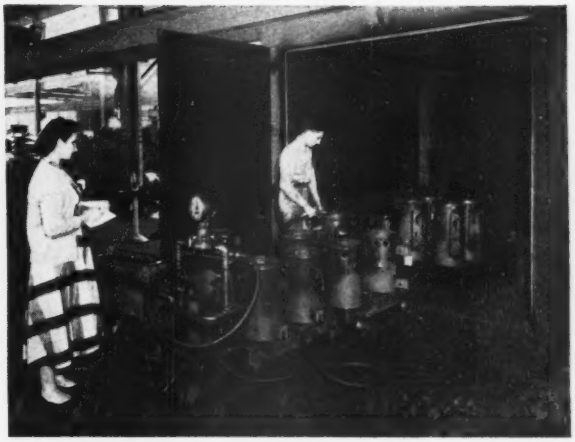
1 Transformer cores are being removed from tanks. All bushings, fittings are also removed. A job number tag is attached to the tank and the small fittings are placed in a metal basket which is tagged with the same job number as the tank to which they belong.

2 Tanks are immersed in an alkaline solution to loosen and break down old paint film and sludge on inside of tank, then cleaned with a high pressure steam machine. Tanks are spray painted with a primer and a final coat of G.E.'s famous Melaglyp finish.

G-E Spirakore* replacement core-and-coils

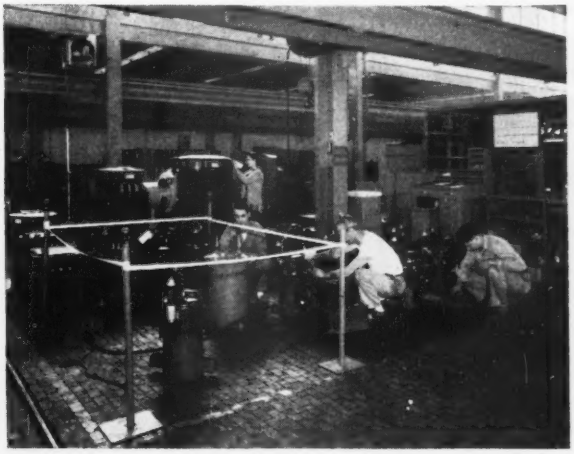
with the same guarantees as a new transformer *at about 2/3rds the cost*

3 Small fittings are cleaned, inspected and spray painted following same careful procedure as that used for the tanks. Here, the completed and painted parts are assorted by job number, to simplify re-installation on the tanks from which they are removed.



4 The tanks with replacement core-and-coils installed are removed from oven while still hot. The core-and-coil assembly is then covered with new G-E No. 10-C oil immediately. The girl is checking oil content to make sure tanks are properly filled.

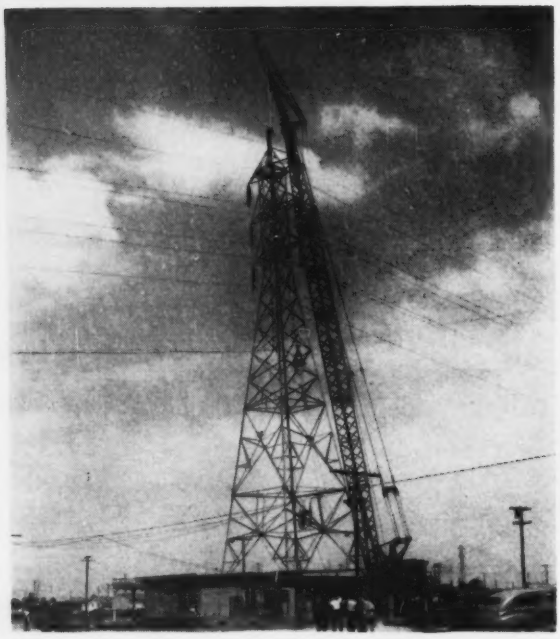
5 In this view, the renovated tanks, reclaimed bushings and accessories are matched to each other for final assembly. At this stage the electrical connections are made to the replacement core-and-coils and transformer is ready for inspection and test.



6 The rebuilt transformer is tested according to factory specifications, and given a final physical inspection. These photos taken in the G-E Service Shop in Richmond, Va., show the careful handling your transformers will receive in any G-E Shop.

You can put your confidence in—

GENERAL ELECTRIC



Up in the air . . .

Near the ground . . .

Or in cramped quarters . . .

Sectionalized 158-ft boom on . . .

Truck-Mounted Crane Speeds Many Jobs and Cuts Labor

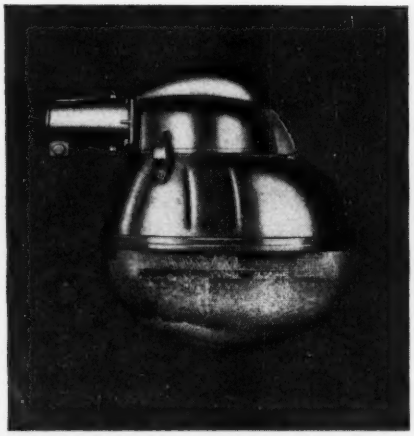
CLAYTON M. ALLEN, Engineer in Charge, General Plant Division, Los Angeles Dept of Water and Power

A sectionalized 158-ft boom and excellent maneuverability of a 45-ton truck-mounted crane have combined to speed the work and lessen the labor of many construction and maintenance jobs on the Los Angeles Department of Water and Power system. Synchronous condensers, stators or rotors, weighing up to 70 tons each, may be installed in one day and use of cribbing and rollers eliminated. Transformers are moved from one receiving station to another with the aid of low-bed trailers rated

(*Continued on page* 94)

BOTH HIGH-SPEED SAFETY AND LOW MAINTENANCE COST MADE POSSIBLE WITH G-E FORM 109 LUMINAIRES.

Safe speed with G-E Form 109's on two New Jersey Turnpike bridges



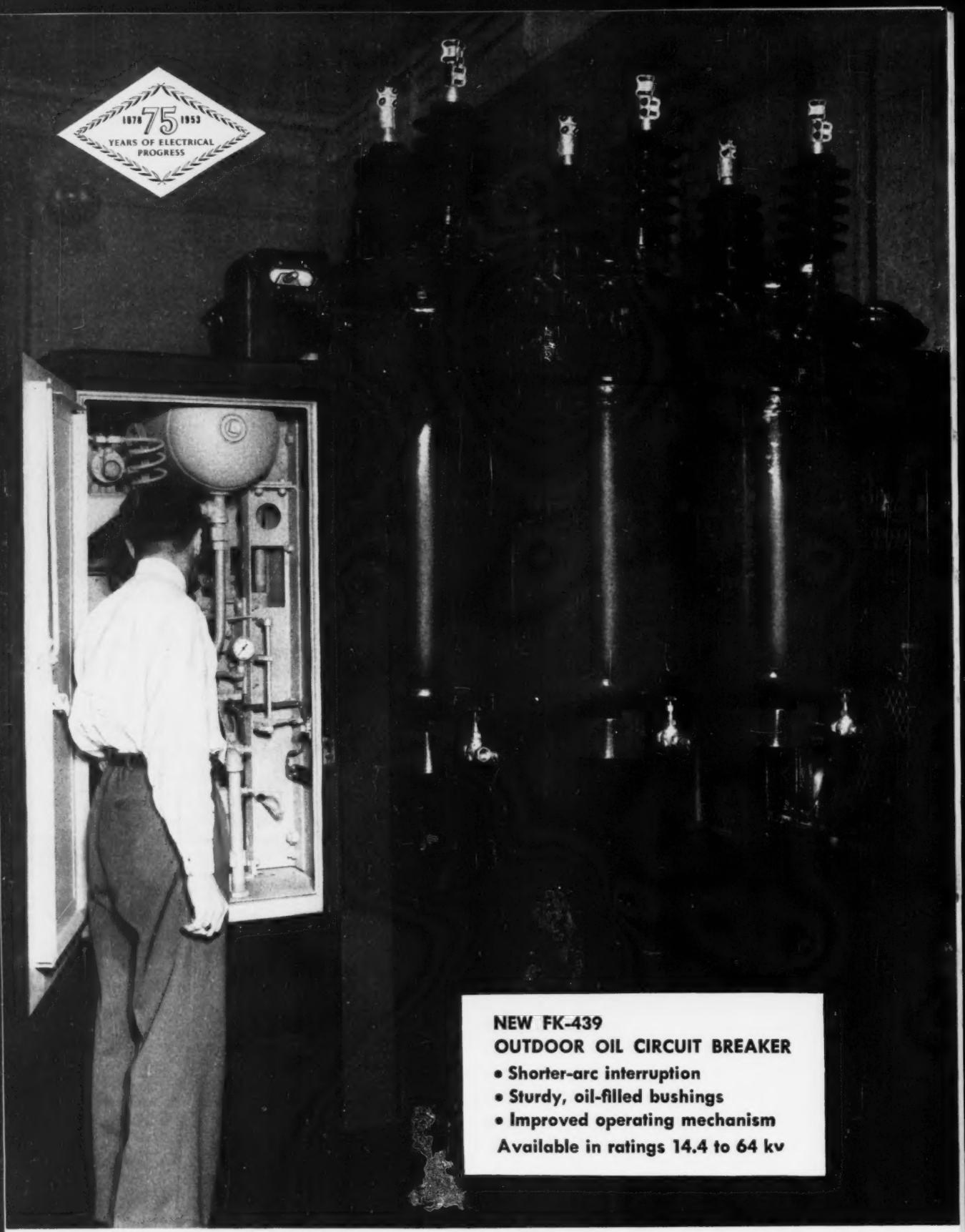
G-E FORM 109 features rectangular pattern, uses mercury or filament, gives economical mercury-lamp operation with magnetic coil.

NO NIGHT FATALITY has occurred on the two New Jersey Turnpike bridges illuminated by G-E Form 109 Luminaires, despite heavy traffic averaging 84,000 vehicles during every 24-hour period. The Form 109's make safe, high-speed driving possible where the New Jersey Turnpike bridges the Hackensack and Passaic Rivers, and warn motorists of the change from the usual straight-away travel.

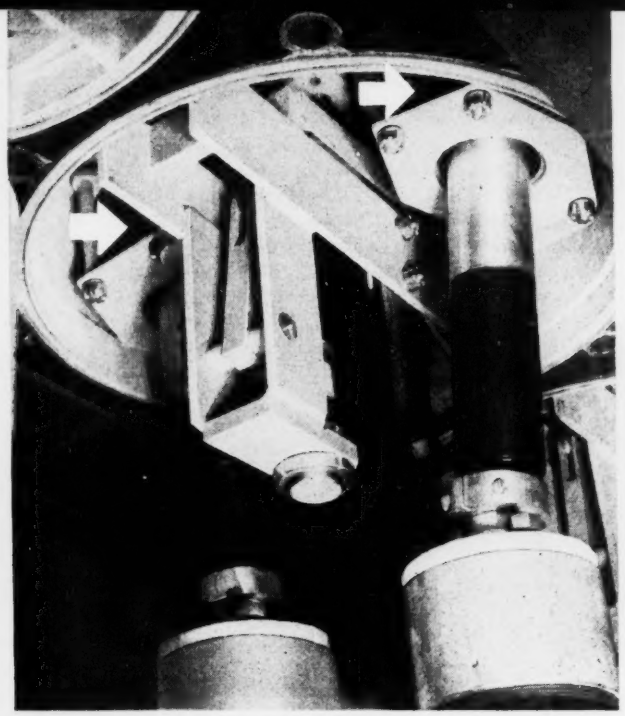
USE FILAMENT LAMPS. Average intensity of 0.6 footcandles on the concrete roadway is provided by 133 G-E Form 109's equipped with 10,000-lumen, 20-ampere filament lamps, at a mounting height of 30 feet to light center, with 100-foot staggered spacing. Poles are isolated from the road area with a special bracket mount which mounts them over the side of the bridge structure.

LOW MAINTENANCE. The G-E Form 109 luminaire gives you the flexibility of using either mercury or filament lamps, the economy of G-E standardization, and extremely high light utilization. You are assured of minimum maintenance cost with quick, easy relamping and low glassware breakage. For information, ask your G-E representative for Bulletin GEA-5419. Or write Section 452-135, General Electric Company, Schenectady 5, New York.

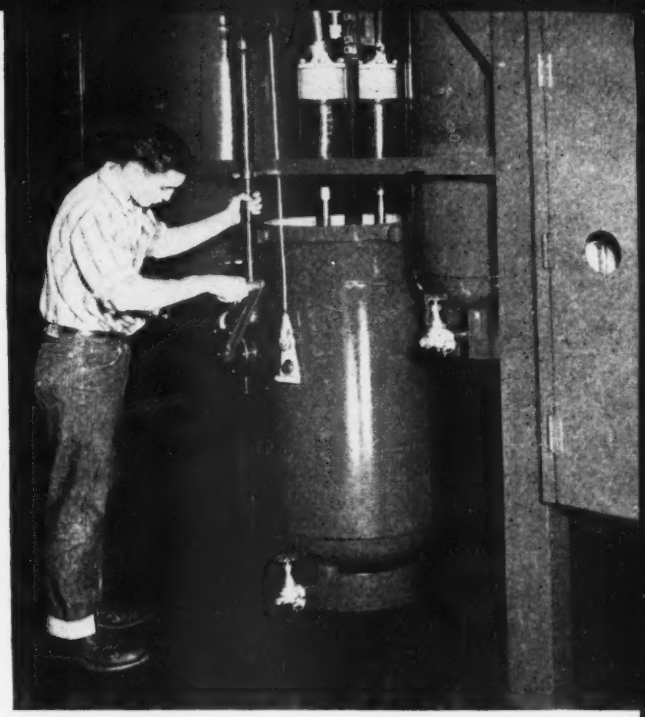
GENERAL ELECTRIC



NEW BREAKER, shown here assembled on factory floor, is designed so that all parts are easily accessible for inspection or maintenance. Positive indicating mechanism makes it easy to see breaker position (open or closed) from any angle.



TWO CURRENT TRANSFORMERS provide extra metering when needed. New design provides room for installation of two transformers *on each bushing* as shown.



TANKS MAY BE LOWERED in the field for easy access to bushings and contacts. This makes it unnecessary to drain oil during inspection or maintenance.

New G-E breaker interrupts with shorter arc to cut oil maintenance

New design features improve reliability, simplify maintenance

Improved service reliability and reduced need for inspection and maintenance are the outstanding advantages of the new Type FK-439 and 1200-ampere outdoor power circuit breakers.

New oil-blast interrupters cut oil carbonization by interrupting faults or load currents with short-arc lengths and low-arc energy. Silver-molybdenum surfaces on the interrupter contacts insure minimum erosion. As a result, fewer inspections will be found necessary, and oil maintenance requirements may be substantially reduced.

Contributing to greater reliability in service is a new, sturdy oil-filled bushing, Type LC. It is of center-clamp construction, thus eliminating all cemented joints. Lower ends of bushings are given a special coating to reduce the electrostatic deposit of carbon particles. This means even less maintenance. Space is provided for two current transformers on each bushing.

The new Type FK-439 breakers are powered by an improved pneumatic operating mechanism, which employs a simple pneumatic trip-free linkage design, completely eliminating the need for a flying latch. Simplified support framework, float-type oil gauge and more accessible pole-unit linkage are among the many detail improvements. For full information, call your local G-E sales representative or write to General Electric Company, Schenectady 5, N. Y. 8724

GENERAL ELECTRIC

Truck-Mounted Crane

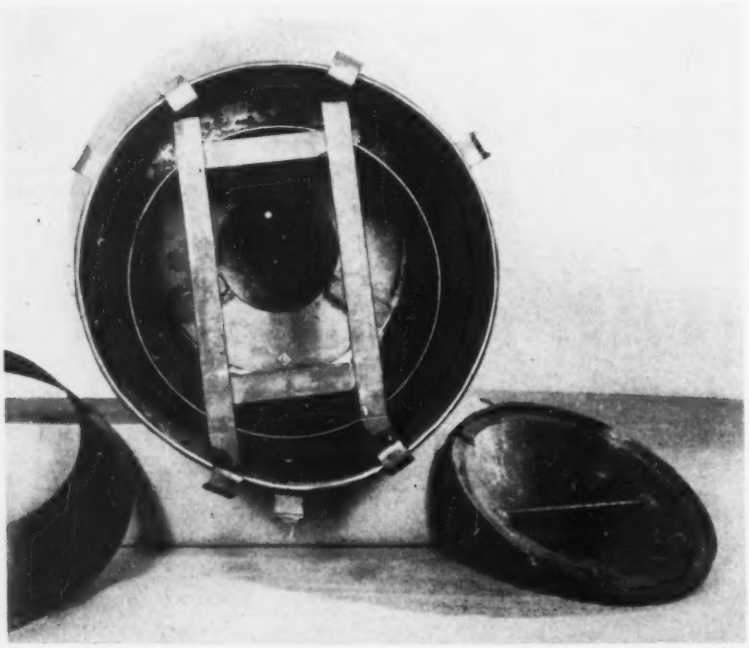
(*Continued from page* 90)

up to 110 tons. Towers can be erected in sections or moved in one piece and concrete poured in minimum time.

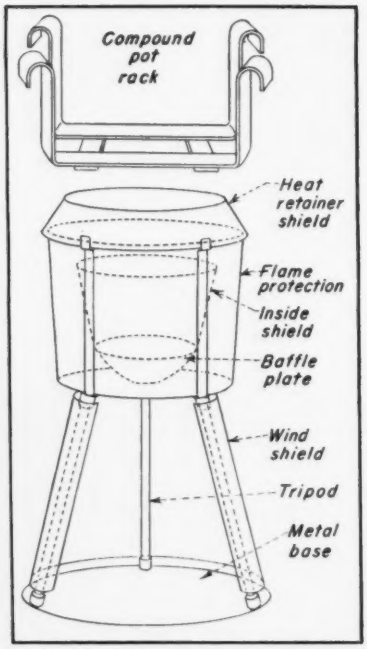
The crane and carrier, powered by two 225-hp diesel engines, work with a boom that may be made up in lengths of from 35 ft to 158 ft, including a 25-ft jib. Capacity of the crane ranges from 45 tons with outriggers for the 50-ft boom to 3 tons with the 158-ft boom, all ratings being at 85% tipping. Because the crane is over the maximum width allowed on Los Angeles streets, special city, county and state operating permits are required.

Relocation of a tower (upper left) 20 ft in only 45 min illustrates the time and labor saved through use of the crane. The job was done on a Sunday morning using a 138-ft boom and 25-ft jib. Tower with conductors attached weighed about eight tons. Conductors were run through stringing sheaves so that the tower could be moved with the conductors in place. After lifting the tower eight feet, the crane was slowly moved by means of a power-operated winch on another truck instead of under its own power. This was done to insure greater stability and prevent the tower from swaying. The line was out six hours.

It would have taken an estimated three or more days to move the tower by jacking and rolling it or by disassembling and re-erecting it at the new location. Total transportation crew consisted of a crane operator, a truck driver for the crane carrier, a truck driver operating the truck and winch which moved the crane, and a transportation dispatcher. Operating personnel consisted of four patrolmen, four helpers, and one foreman.



INSIDE TOP VIEW of heater showing compound pot rack inserted but baffle plate and heat retainer shield are removed. Compound pail is set into the inside shield



PORTABLE HEATER'S baffle plate and inside shield sit on top of a kerosene furnace

Portable Heater Safely Liquefies Insulating Compounds

WILLIAM C. MILLER
EDWIN M. DONHAUSER

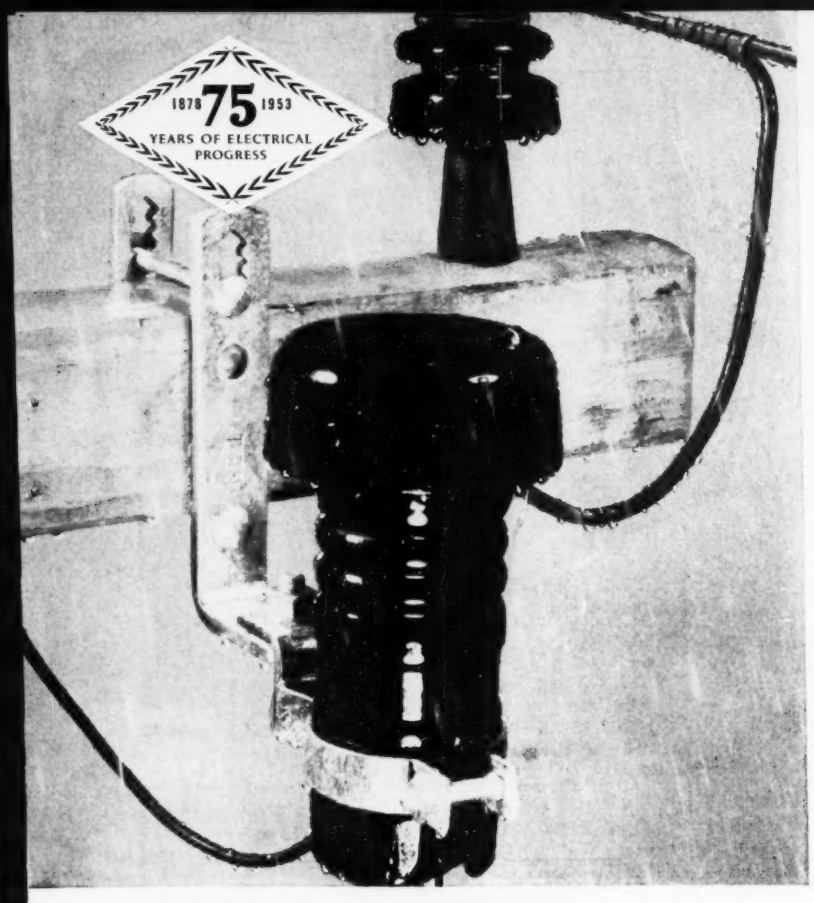
Electric Distribution Dept, Consolidated Gas Electric Light & Power Co of Baltimore

Development of a portable heater has resulted in a faster and safer method of liquefying insulating compounds used for cable joints and potheads. These compounds, being viscous substances, are heated in the pail in which they are supplied and must be transferred to a pouring kettle.

This improved method of heating liquefies the compound near the sides of the pail first, automatically venting the compound pail. Thus local overheating which formerly caused high pressure bubbles is eliminated.

The compound heater illustrated utilizes a kerosene furnace whose flame impinges directly on a heavy metal baffle plate. Heat is directed up along the sides of the compound pail into a jacket formed by the flame protector and the inside shield. Inclusion of the shield provides for uniform heating. The heat retainer shield at the top reflects the rising heat down onto the surface of the compound.

Previously the compounds were heated by direct application of flame to the bottom of the pail. Because of the poor heat transfer characteristics of the compound, the compound at the bottom of the pail would liquefy, while that at the top of the pail would remain quite viscous. High pressure bubbles would form at the bottom and, if not given a free path for expansion by venting the compound, would blow the mass of hot compound out of the pail with explosive force.



General Electric Pellet Arresters give the same excellent protection to transformer windings in wet weather or dry, in low humidity or high, when new or after years of service. And their low sparkover voltage and low IR drop assure a degree of this protection unexcelled by any other distribution arrester.

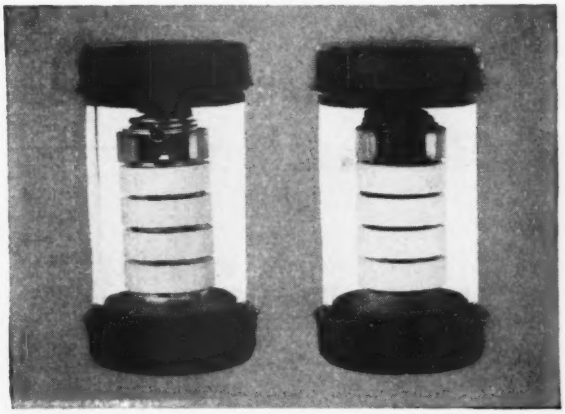
MOISTURE doesn't hurt this arrester

The General Electric Pellet Arrester has a unique valve element that is unaffected by service moisture—and gap electrodes that are sealed in dry nitrogen (N_2)—exclusive features that mean more enduring protection against lightning.

In addition, pellet arresters use inorganic insulation throughout—no internal fiber to "track", carbonize or wear away. Whether valve- or expulsion-type, no other distribution arrester is so unaffected by service moisture.

For more information see your nearest G-E Apparatus Sales Office, or write for Bulletin GEA-2975 to Section 432-2, General Electric Co., Schenectady 5, N.Y.

Valve Element Unaffected by Service Moisture! Efficient valve element is a column of lead peroxide pellets—pellets which are actually formed with water in a tumbling barrel (above). Moisture in service causes no change whatever in the unexcelled protective characteristics of this pellet valve column.



N_2-filled Gap Excludes Corrosive Moisture! Here's life-test proof: electrodes at left were sealed in dry nitrogen—those at right sealed in air, and both exposed outdoors under maximum rated voltage. Result: N_2-protected gaps are bright and clean; gaps sealed in air are discolored and corroded.

You can put your confidence in—

GENERAL ELECTRIC

Low-Cost Sectionalizing Builds Better Service

Automatic sectionalizing of a 33-kv line at point remote from any attended substation has been provided at very low cost with hydraulically operated air break switches. The installation is on the Lake Superior District Power Company system at Medford, Wisconsin.

A six-volt storage battery supplies power to a motor which drives a pump to develop the necessary hydraulic pressure for operation of the switches.

Normal feed for the 33 kv line is from one direction. There is a small diesel engine generator at the end of the line and when the 33 kv line trips out the serviceman starts the generator. If the generator is started before service is restored from the normal source the air break switches at Medford operate to restore service there. For example, if the line trips, both switches A and B at Medford (Fig 2) open. If the diesel engine is started before the line is energized at its normal source, then Switch B closes automatically, locking out switch A and restoring service to Medford. If service is restored on the line from its normal source before the diesel engine is started then Switch B (Fig 2) closes, restoring service to Medford and locking out switch B.

If the line fault is in the section of line between Switch B and the diesel engine generator, then Switch B remains open. Service is supplied to Medford from the normal source and the diesel engine generator supplies the substation serving the community at that end of the line, until normal conditions are restored.

By selecting time settings on the different switches at 30, 40 and 60 seconds their operation is coordinated to avoid undesirable opening and closing.

A trickle charger keeps the battery charged. When the battery goes dead it will be replaced.

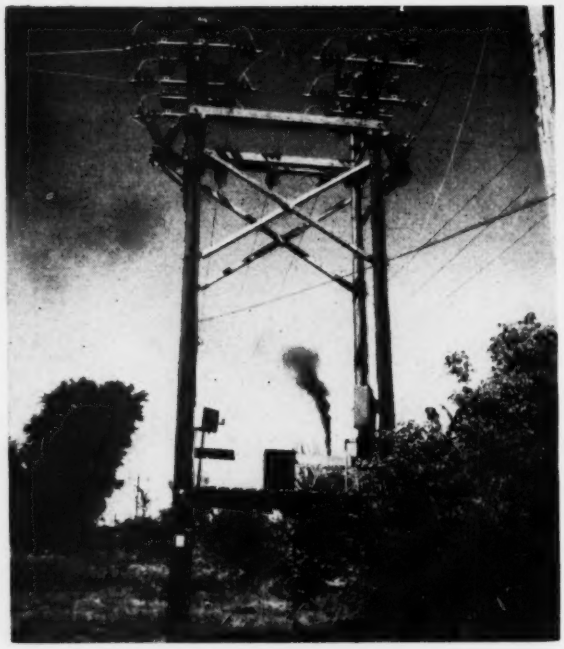


FIG 1—AIR BREAK SWITCHES automatically controlled by hydraulic mechanism which opens both switches in case line trips out

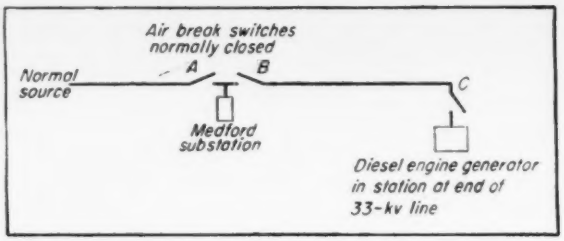


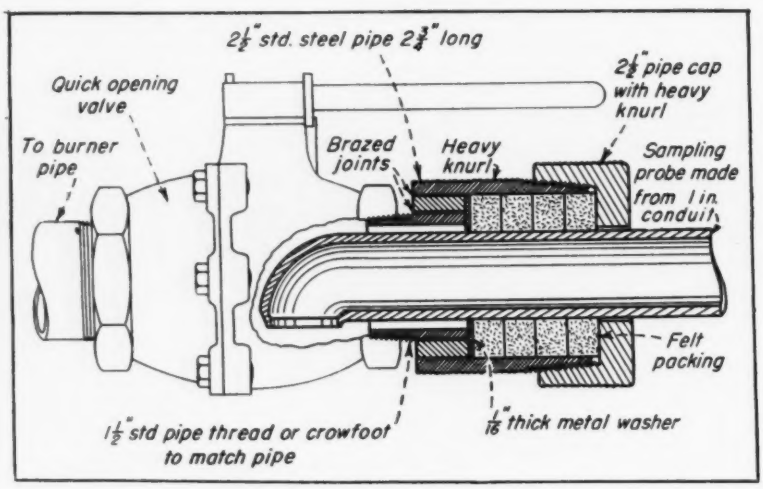
FIG 2—33-KV LINE with one normal source of feed can be fed under emergency conditions by diesel engine generator

Improved Probe Seal Reduces Coal-Sampling Time

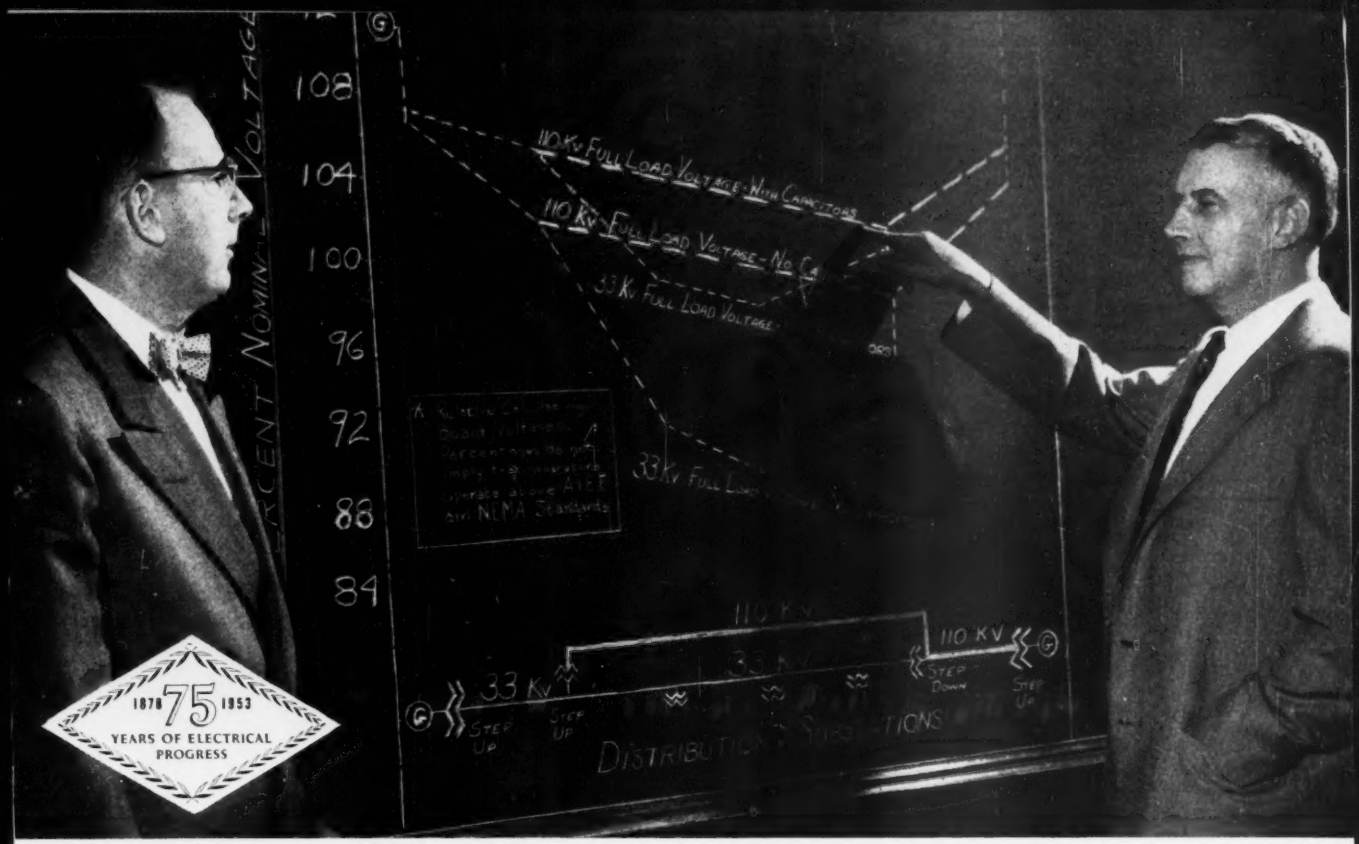
T. J. HARDING, Master Maintenance Man, Indiana & Michigan Electric Co, Lawrenceburg Indiana

An improved version of the probe seal for sampling pulverized coal was fabricated in the form illustrated and tested at the Tanners Creek Plant. Tests demonstrated these advantages:

1. Elimination of a seal at each sample point.
2. Sampling time reduced since probe is not fitted into seal at each sampling point.
3. No danger of felt being pushed into fuel line.
4. Longer life of seal.
5. Packing gland keeps felt seal tight preventing coal dust leakage.
6. Felt seal can readily be replaced.
7. Sampling accuracy maintained.


2½" std. steel pipe 2¾" long
2½" pipe cap with heavy knurl
Quick opening valve
To burner pipe
Brazed joints
Heavy knurl
Sampling probe made from 1 in. conduit
Felt packing
1½" std pipe thread or crowfoot to match pipe
1/16" thick metal washer

A seal of this type can be fabricated by a competent machinist with negligible expense for material or labor. One requirement is that minimum thickness of felt for packing should be ¾ in.



VOLTAGE IMPROVEMENT obtained with switched capacitors is discussed by F. M. Reed, (right), System Planning Engineer for Pennsylvania Electric, and A. M. Dawson, G-E Sales Representative. Blackboard diagram summarizes effect of capacitors on system regulation.

G-E switched capacitors help regulate voltage on Penelec's whole system

120,000 kvar of capacitors give system-wide voltage-boost, release kilowatt capacity—reduce system investment.

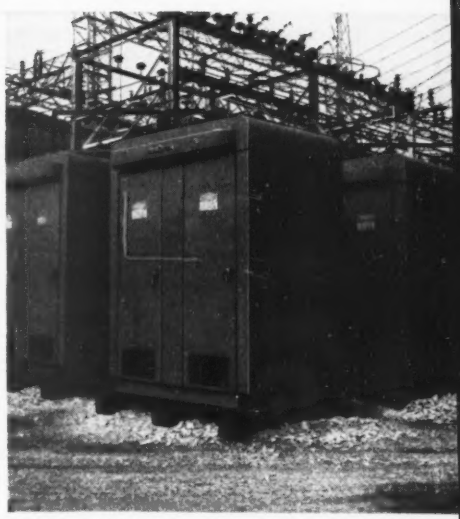
To complement its generator bus regulation, the Pennsylvania Electric Company of Johnstown, Pa. has installed 120,000 kvar of switched capacitors. Within the next year, this will be increased to 150,000 kvar or 1 kvar for every 3.64 kw of its estimated 1953 peak load of 546,000 kw.

The automatically controlled capacitors assure adequate local generation of kilovars and provide a needed voltage boost on distribution circuits. But they do more than this.

By relieving transformer, transmission, and generating facilities of reactive load, the capacitors reduce voltage drop and improve voltage regulation throughout the entire system—as much as 20% at full load at the distribution level.

This permits the Penelec system to carry more kilowatts within the limits of good regulation. And since the cost of capacitors needed to release capacity is less than the cost of new capacity, the system investment per kilowatt is reduced.

G-E automatically switched capacitors may prove economical on your system, too—for improving voltage, releasing capacity, reducing losses, and keeping system investment down. For more information, get in touch with your local G-E Apparatus Sales Office, General Electric Company, Schenectady 5, New York. 441-1



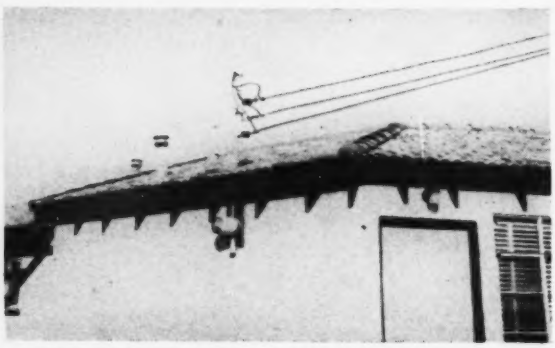
58,000 KVAR of switched capacitors at Penelec's substations use current compensated voltage control to provide bulk kilovars, improve regulation when load is heavy. An additional 62,000 kvar of switched capacitors are installed out on feeders. Units boost voltage, reduce losses by an estimated 8%.

GENERAL ELECTRIC

Height to Erect Conduit Service Risers Above Roofs of Residences

Data are given for installation of service drops to residences with low or flat roofs

CONDUIT RISER, 1¼ in., is terminal for 100-ft run of No. 6-6-6 WP triple-braid conductors in horizontal arrangement 12 in. above roof



VERTICAL ARRANGEMENT has 1½-in. riser for 75-ft run of No. 4-6-4 WP, triple-braid conductors with middle wire 18 in. above roof

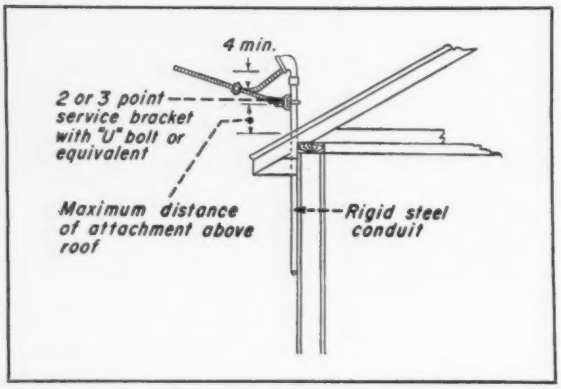
H. M. WILLIAMS, Electrical Inspector, California Electric Power Co, Riverside, California

Houses built with low or flat roofs make difficult the running of service drops and maintaining proper ground clearance without erecting a framework, post or riser on top of the building.

The periscope type of service riser is quite popular for service attachment because most frameworks or posts are unsightly. Strength of riser required presents a problem.

Accompanying table lists the maximum distance of attachment above the roof for different sizes of risers and types of services.

Service risers must be fastened rigidly to the walls and rafters of the building, and have metal flashings to prevent leakage where the risers pass through the roof.


4 min.
2 or 3 point service bracket with "U" bolt or equivalent
Maximum distance of attachment above roof
Rigid steel conduit

ARRANGEMENT for conduit service riser above roof of residence

Maximum Height Above Residential Roof to Extend Riser for Various Sizes of Service Drops.

Conditions:

1. Light Loading
2. Safety factor for tubular steel arms, etc.,=1½
3. 100-ft service conductors, WP triple braid
   - No. 6 pulled to 75 lb per wire
   - No. 4 pulled to 85 lb per wire
   - No. 2 pulled to 100 lb per wire
4. All wires attached horizontally at one point

Rigid Steel Conduit Size In.	Wire Size AWG	Service Length Ft	Maximum Distance of Attachment Above Roof Ft In.
1¼	6-6-6	100	2 — 9
1½	6-6-6	100	3 — 9
2	6-6-6	100	6 — 8
2½	6-6-6	100	12 — 7
1¼	4-6-4	100	2 — 7
1½	4-6-4	100	3 — 5
2	4-6-4	100	6 — 0
2½	4-6-4	100	11 — 7
1¼	4-4-4	100	2 — 5
1½	4-4-4	100	3 — 3
2	4-4-4	100	5 — 10
2½	4-4-4	100	11 — 2
1¼	4-6-4-6	100	1 — 11
1½	4-6-4-6	100	2 — 7
2	4-6-4-6	100	4 — 8
2½	4-6-4-6	100	8 — 10
1¼	2-4-2	100	2 — 2
1½	2-4-2	100	2 — 11
2	2-4-2	100	5 — 3
2½	2-4-2	100	9 — 11
1¼	2-2-2	100	2 — 0
1½	2-2-2	100	2 — 9
2	2-2-2	100	5 — 0
2½	2-2-2	100	9 — 5

Blast the Arc WITH DELTA-STAR'S NEW "JT-1"

Gas Blast Interrupting Device

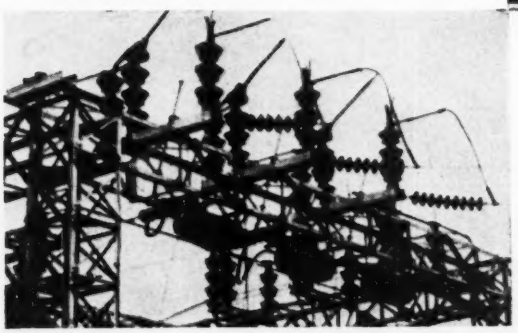
Delta-Star's new "JT-1" interrupting device for use with standard air switches is now ready for installation on your transmission systems. Extensive laboratory and field tests including many actual installations have proved the "JT-1" to be the ideal device for use on transmission lines from 69 to 161 kv where circumstances do not require the interrupting capacity or justify the use of a circuit breaker. With the "JT-1" installed on your air switches light loads can be interrupted without danger of long arcs causing phase-to-phase faults.

The "JT-1" is a gas blast device utilizing compressed nitrogen or air to "blow out" the arc at the contacts of a switch immediately after the arc has formed. The gas blast is controlled by a cam operated valve mechanism under each switch unit which is in turn operated directly by the switch operating mechanism. These valves open automatically when the switch blade reaches a predetermined position.

Since arc extinction does not depend on gas expulsion by disintegration of an arc chamber an unlimited number of operations are possible without replacement of parts.

The next time you have a problem where switches must be operated under load or long lines dropped, investigate the possibility of using Delta-Star "JT-1" interrupters. For full particulars write the factory or nearest district representative.

"JT-1" Interrupter mounted on 115 kv "MK-40" disconnect.

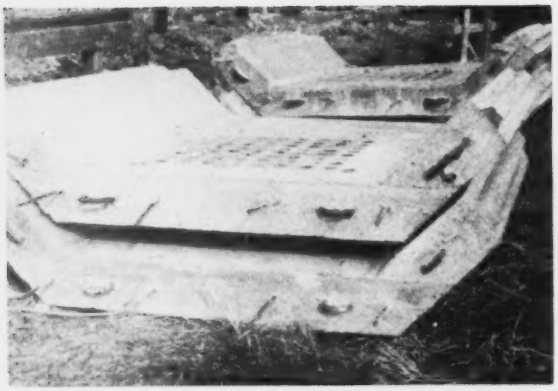


Installation of "JT-1" Interrupters on 115 kv "MK-40" 3-pole group operated switches. Photo shows blade position immediately after arc was extinguished.

WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHING EQUIPMENT SPECIFY DELTA-STAR

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
2437 FULTON STREET, CHICAGO 12, ILLINOIS
DISTRICT OFFICES IN PRINCIPAL CITIES



SECTIONS are cast in horizontal position either in substation yard or in headquarters yard. Forms are reused.

PRECAST SECTIONS slide together for tight fit. Duct entrances are cast in sections. Top of manhole is poured in the field

Pre-Cast Concrete Sections Cut Manhole Costs

S. J. WARD, Superintendent of Substation Construction, Houston Lighting and Power Co, Houston, Texas

Control cable manhole costs have been reduced on the Houston Lighting and Power system by the development of manhole design and construction methods that have several advantages over the standard method of building forms in place in the field and pouring concrete on the job. Precast concrete shapes that fit together tongue and groove fashion are poured in the yard at construction headquarters and hauled to the job.

Greatest advantage of the precast manhole sections is the elimination of caving of. The hole can be excavated and manhole sections put in place quickly, before the sides have had time to cave.

Another advantage is the elimination of forms and bracing for every manhole. Forms are used repeatedly for pouring sections. When the hole is dug the sections are put in place quickly which eliminates the need for bracing to prevent caving.

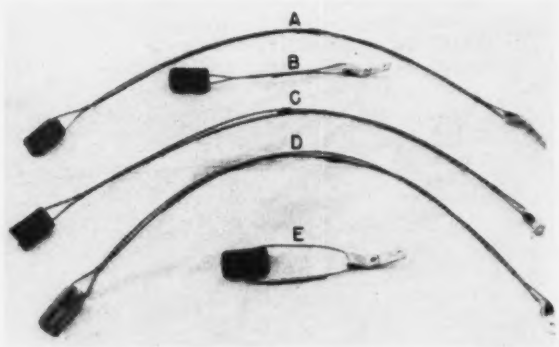
Duct entrances are included in the cast sections. Eyes for lifting are cast in the concrete. A special expanded shale concrete reduces weight by approximately 40% and this greatly simplifies hauling and handling.

Made-up Guys and Deadends Save Crew Time

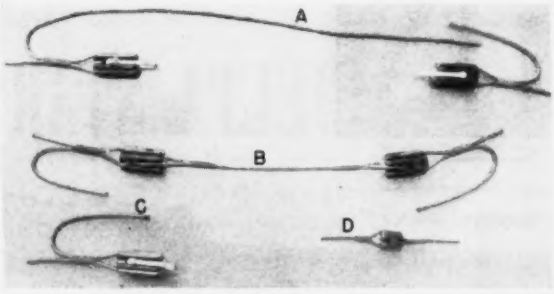
BEN GLUNT, Cincinnati Gas and Electric Co, Cincinnati, Ohio

Fabricating guys and deadends in the shop for various types of construction saves Cincinnati G&E construction crews an appreciable amount of field assembly time. This work can be done by lineman who are not physically able to climb or by line crews during inclement weather. Assemblies are stocked and charged out as a unit.

The guy leads and deadends are made up with used or short lengths of wire that would otherwise be scrapped. Deadends are fabricated with No. 2 and No. 2/0 weatherproof wire. Their joints are copper moused, soldered and taped. Sufficient wire is left on deadend assemblies for solderless line splices and for making connections.



ASSORTED GUY LEADS are made up in 1½ ft, 2½ ft and 8 ft lengths with two-bolt angle guy, thimble eyes or angle thimble eyes attachments. Assemblies A to E were fabricated from used guy wire



MISCELLANEOUS DEADENDS and breakers are fabricated in the shop using No. 2 and No. 2/0 wire. Excess wire is cut off when splices or when connections are made. Deadends shown include (A) No. 2/0 weatherproof for corners and terminals; (B) No. 2/0 weatherproof for junctions; (C) No. 2/0 weatherproof single deadend; and (D) No. 2 weatherproof secondary breaker

ICE CAN MAKE A "HOT LINE" COLD

IF SUSPENSIONS CAN'T STAND THE STRAIN!

Purified Porcelain is good insurance against the hazards of winter. This finest insulator porcelain ever made has unequalled ability to stand stress and strain. Cement is specially compounded and caps and pins are scientifically designed for maximum strength. Victor insulators withstand pull of ice, snow, high winds and endure thermal variations far above NEMA standards. For engineering data on these and other Victor *Purified Porcelain* insulators, send for Bulletin No. 4.

Every Victor Suspension Insulator undergoes this routine tensile test before electrical flashover test.

FREE BOOKLET gives you the full story on how Victor Insulators are made — how and why *Purified Porcelain* was developed. Write us for your copy.

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Specify VICTOR INSULATORS!

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Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelain

NEW

You need it! Send for free copy today!

United States Rubber Company, the only electrical wire and cable producer to grow its own natural rubber and to manufacture its own plastics and synthetic rubber, makes a complete line of electrical wires and cables for every industrial and domestic application. Just published is the 1953 "U.S." Catalog, essential for men who specify, install or maintain electrical wire and cable. Send for your free copy to address below. Here are the catalog chapter headings:

1. U.S. Portable Cords and Cables
2. U.S. Railroad Wires and Cables
3. U.S. Power Cables
4. U.S. Control and Signal Cables
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U.S. RUBBER
SERVING THROUGH SCIENCE

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Truck Mounted . . .

EXTENSION LADDER ON "PICK-UP"

Total cost of installing ladder on light truck is between $140 and $150. Use of small truck by California Oregon Power Co, Medford, Ore., frees larger truck carrying hydraulically operated ladder for other and bigger jobs

IS RAISED BY ONE MAN . . .

Ladder is mounted on metal guide brackets which are fastened to cross bar by straps. Bottom of ladder slides into metal brackets welded to truck chassis. Hooks on ladder engage pins in brackets and hold ladder safely

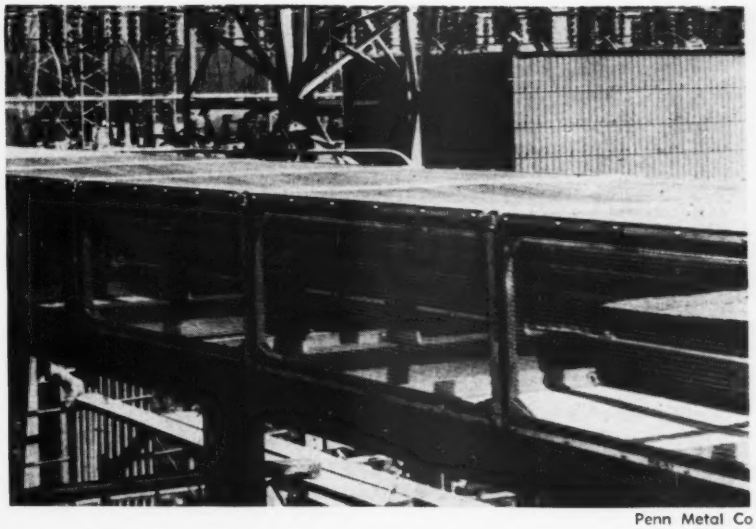
FOR OVERHEAD JOBS

Height of fully extended ladder is 24 ft and allows one man to trim trees, change out street lamps, or make midspan taps. Ten trucks are used in outlying areas

Trailer Doubles As Dump Truck

Dump trailers, built to the specifications of Dayton Power and Light's transportation department have been adapted to many uses in the Company's outlying districts where requirements are not sufficient to economically justify keeping a dump truck. These trailers are suitable for all types of hauling jobs and are particularly valuable for hauling dirt or other loads that can be unloaded by dumping. In the past the body of the construction truck has been used for this purpose and availability of the dump trailer has made it possible to keep trucks cleaner.

These are two wheel utility trailers with dump body 84 in. long, 72 in. wide and having 8 in. sides. They are equipped with electric brakes. Height to top is 102 in., to floor 33 in. Overall width is 81 in. Weight is 2,940 lb and capacity 4,000 lb. Cost is $2,300.



Penn Metal Co

Bus Guard Prevents Outages

Expanded aluminum guards at TVA's Willow Creek Steam Plant, Bridgeport, Ala., protect copper buses from birds and flying debris, preventing many system outages. The ½-in.-0.081 standard sheets are supported on aluminum frames, resulting in negligible weight increase on the buses. Expanded aluminum is cheaper, lighter, and stiffer than regular aluminum sheets. TVA plans similar installations at three other new plants: Johnsonville, Tenn.; Shawnee, Ky.; Kingston, Tenn.

"TOMORROW'S" lamp and heat pump water heater are two of the features getting their share of admiring glances under Commonwealth Edison Co's "Big Top"

ALL ELECTRIC kitchen, complete with refrigerator with freezer compartment, dishwasher and range has been one of the centers of interest in the model home alongside the big tent

Selling Wiring Under the Big Top

Commonwealth Edison Co dramatizes development of electric industry in tent display accompanying model home for 500-unit project featuring certified wiring

With the aid of a "Big Top," Commonwealth Edison Co is showing people of south Chicago how certified wiring contributes to better wiring. The ingredients are a model home for a 500-unit project with certified wiring and a circus-like tent in which is dramatized the march of electrical progress.

In the tent set up alongside the model unit, Commonwealth Edison introduces visitors to yesterday's, today's, and tomorrow's electrical household equipment.

Yesterday is depicted by photo murals of now out-of-date "electrified" homes. Today's equipment is arranged on a stage and includes an electric range, Calcinator, and clothes dryer. Recorded voices describe the appliances and explain the importance of adequate wiring to the use and proper functioning of the equipment. The tomorrow section contains a heat pump water heater, a radar range, and new lighting applications and fixtures.

Well Wired . . . The model home itself is wired for 12 circuits. Other homes will have a minimum of eight circuits, with the larger ones having a dozen. A "path of light" runs through the entire house, to be switched "on" as a person enters at one end of the room and "off" as he leaves the other.

The living room has decorative valance lighting over a picture window, plus a generous number of "triple" outlets; the dining room a ceiling fixture that can be raised or lowered as desired; and the kitchen an electric dishwasher, garbage disposer, exhaust fan, electric range, and electric refrigerator.

Bedrooms have outlets on every wall, conveniently located for clocks, lamps, radio, electric blanket, and other appliances. Mirror lights, built-in electric heater, and a sun lamp are bathroom features. Set off from the rest of the house is the den with room air conditioner, television set, electric sewing machine, and convenience outlets for every electrical need. In the basement is an oil burner, electric Calcinator, automatic washer, electric clothes dryer, and electric ironer.

On the outside, below the picture window, is a convenience outlet for plugging in Christmas lights, hedge clipper, lawn mower, and vacuum for cleaning the car.

During the first six weeks of the showing more than 28,000 persons passed through the model home. Commonwealth officials expect to use it to promote use of electrical appliances throughout south Chicago, not only in the certified wiring project.

Stores Receive First Bendix Washer-Driers

Appliance stores across the country are about to get their first shipments of the new Bendix Duomatic washer-drier, according to Judson S. Sayre, general manager. The first home laundry device that dries as well as washes is only 36 in. wide, and will launder an average load of all sorts of clothes in one hour and eight minutes.

The machine may be used separately as either a washer or drier. Its price is less than the combined one for Bendix' present washer and drier.

New GE Floor Lamp

New 300w PAR-56 flood lamp of an all-glass sealed-beam type has been developed by General Electric Co's Lamp Division at Nela Park. Described as a "precision" lamp, its medium-spread beam is designed on the principle of an automobile headlamp. The lamp will fill many outdoor lighting needs, and such interior applications as show windows, displays, stages, and exhibits.

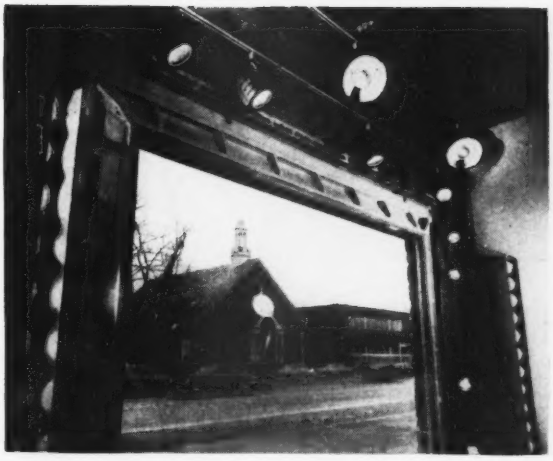
Lighting Changes Eased With Tracks

A device to mount movable lights on a series of tracks to save time and effort in making window display lighting changes has been devloped by a New York City lighting consultant, Edison Price.

In the system now being used in Abraham & Straus stores in the New York area, the electrified track on which the lighting units are mounted is supported by an adjustable framing structure consisting of steel channels and connecting fittings.

Laid across the top is a grillwork of welded steel rods spaced on 6-in. centers, from which display props may be suspended.

Overhead spotlights and beam projectors are mounted on two parallel rows of trolley bus running the length of the window. An additional length is installed vertically on each side of the window, supporting and providing current for reflector lampholders. Background lighting is provided by strips 7-ft long, employing reflector lamps, standard size color filters available in 15 colors, and optional spread lenses.



SET-UP for the flexible lighting arrangement first used in the Brooklyn store of Abraham & Straus

Abraham & Straus has used the setup for over a half year in a window of its main building in Brooklyn. It has been adopted for a new branch store in Hempstead, Long Island.

Municipal Puts Faith in Installation Allowance

Orlando Utilities Commission is putting most of its promotion dollars these days in an installation discount plan arranged with dealers and contractors in its service area. The Florida Municipal will allow $42.50 for wiring an electric range and $10 toward installing an electric water heater.

The plan applies only to existing houses and not to new construction. Allowances cover average costs.

1953 Sales Plans of PP&L

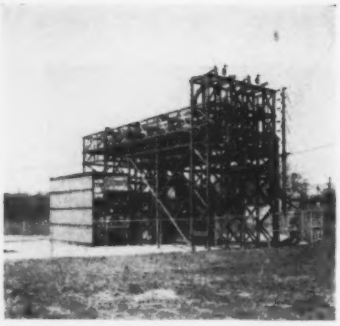
Continuing its established practice of selling business enterprise in a free economy along with electrical goods and services, the Pennsylvania Power & Light Co has set up its 1953 sales program. Activities are detailed in a 52-page brochure with the title, "The Greatest Business on Earth," in three-ring circus style. To channel the sale of appliances and other electrical goods through its "sales allies"—the local trade—is the policy of PP&L. The plan book is directed towards these allies, telling them what the company plans to do in residential, farm, commercial, industrial and area development promotion.

General Electric Co

Capacitor Pays for Itself in Store

A Cleveland department store's investment in capacitor equipment has enabled it to write off total capacitor and installation costs in six months. According to officials of the Halle Brothers Co store, $200 was saved over the cost of installation in the first year. They expect to save $800 each succeeding year. Original cost of capacitors and equipment was $620.

Since installation of the three-phase, 60-cycle capacitor rack in June, 1950, the store's power factor has improved about 20%. Total power billing has been reduced 18 to 20%.



ENGINEERING NOTES

High Speed Camera Records Tests at Substation Laboratory

KEARNEY Test Engineers now use an ultra high-speed camera to photograph equipment undergoing actual short circuit test. If you have ever watched a fuse cutout clear a fault, for example, you know that the action happens too fast, with too much flash for the unaided eye to see. Yet design engineers must have a visual record of equipment operation in order to produce efficient, trouble-free apparatus. This new camera provides us with just such a graphic record.

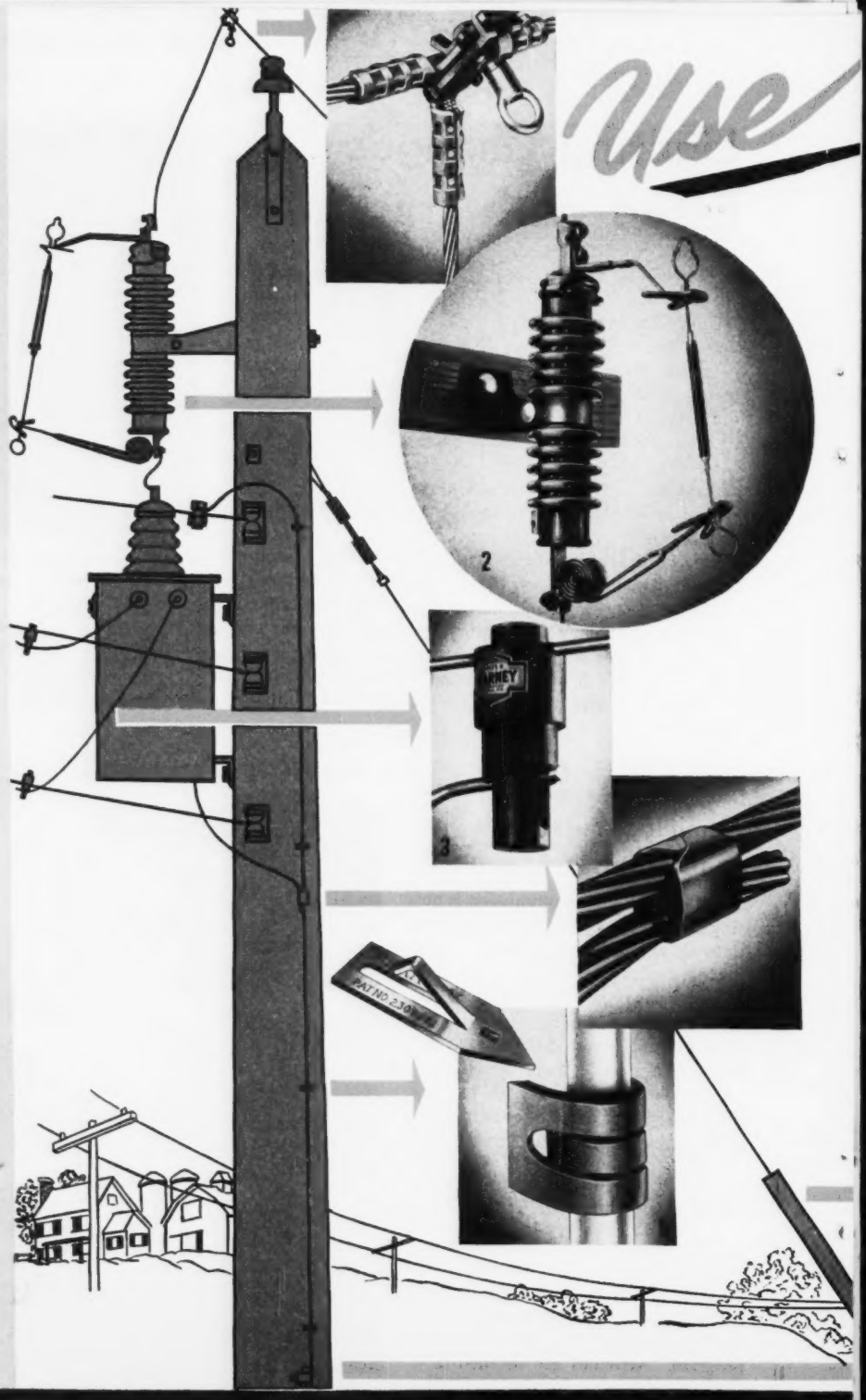
Top speed of the camera is about 7000 frames or pictures per second. Two high-speed motors combine to pull a full 100 feet of black and white or color film past the aperture in 1.3 seconds! This means in effect that time is magnified by a factor of 200 when the developed film is projected at the normal rate of 16 frames per second. The film moves so rapidly through the camera that it is impossible to use a mechanical shutter. Instead, motion is stopped by refraction of light through a rotating prism synchronized with film travel.

This actual motion picture of equipment operation is carefully studied, analyzed and compared with oscillograph records in order to make certain that each Kearney Product is designed for maximum service life.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

The Mark of Quality Products

JRK-210



You do a better Rural Line Job with

1 Kearney Pressur-Tap Clamps — make permanent live line taps with no conductor pitting.

2 Kearney Trip-O-Link Fuse Cutouts — designed for full rated service 5 to 69 KV; up to 100 amperes.

3 New, Improved Secondary Cutout — protects transformers against excessive overloads or shorts in secondary circuits.

4 Kearney Squeezon Connectors — high compression connections eliminate oxidation at all points of contact.

5 Kearney Non-Static Ground Wire Clips — replace wire staples to eliminate radio and television interference.

6 Kearney Full-Vu Guy Guards — are full round — insure safety to live stock and pedestrians.

7 Squeezon Ground Rod Fittings — provide permanent, high conductivity ground connections.

8 Kearney Two-Way Expansion Anchors — expand 2½ times their rated size — meet all holding power requirements.

KEARNEY PRODUCTS

for GREATER ECONOMY *in* RURAL DEVELOPMENTS

WHERE BUDGETS . . . and loads . . . are limited, these Kearney products go a long way in holding down distribution and maintenance costs.

The important thing to remember is that Kearney design engineers have reduced expense without forfeiting dependability. After all, a low first cost is false economy when you risk continuity of service as a result.

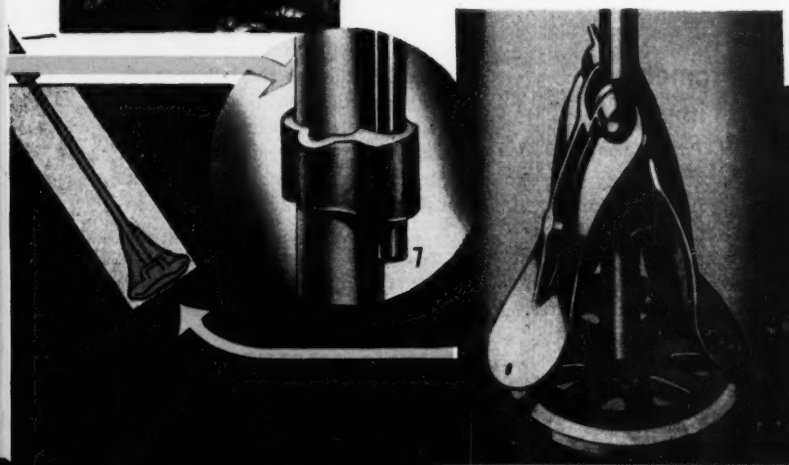
Take Kearney's malleable anchor for example. We all know that one insecurely anchored pole can cause thousands of dollars damage. It makes sense, then, to specify "Kearney Malleable" on anchor orders. When you do you're getting unlimited service life, and at low cost, too. Customers tell us that malleable iron outlasts all other construction materials. In fact, we have at our plant, an anchor removed from service after 21 years underground. After sandblasting we found that it is in almost perfect condition, good for many more years than the pole line will last. That's the kind of performance you count on with Kearney Malleable Anchors.

While we're talking about good service, have you seen our Squeezon Hydraulic Tool in action? This versatile, easy-to-use tool quickly makes tap connections, line splices or applies ground rod fittings. 20,000 pounds of force are used to make permanent connections that can't be beat for conductivity today, next month or 20 years from now. Ask your Kearney representative to demonstrate the tool for you.

The name "Kearney" is an old "stand-by" in rural construction. If you are planning any building or maintenance projects it will pay you to get in touch with the Kearney Corporation. We may have suggestions which will mean real savings for you.

JAMES R. KEARNEY CORPORATION

4224-42 CLAYTON AVE., ST. LOUIS 10, MO. • Canadian Plant: Guelph, Ont.



For More Information . . .

MAIL COUPON TODAY

DEPT. 12
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Ave., St. Louis 10, Mo.

Gentlemen:
Please send complete information on —

No's _____

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

How Important Are Industries to Utilities?

A brief look at the records of some of the major industries indicates that they are very important to electric utilities

H. C. COLEMAN, Manager, Industry Engineering Dept, Westinghouse Electric Corp

The tremendous expansion of our industrial facilities and production is of great importance to our electric utilities. Increased speeds of process and production lines call for more power, and this trend continues. All facets of industry require electrical power from the electric utilities, even though some of them generate a part of their needs. A quick look at some of the larger industries shows some interesting figures.

Steel . . . In 1950 the total kwhr consumption for the steel industry was 25 billion, of which approximately 16 billion kwhr were purchased from power companies. This 25 billion kwhr produced 96.9 million ingot tons of steel, making an average power use of 258 kwhr per ton. In the next 2 yr the ingot capacity will be increased by approximately 10 million tons per year, which means a yearly increase in the power consumption of 2.5 billion kwhr of which about 1.6 billion kwhr will come from the electric utilities.

From 1940 through 1951 the mill drive horsepower in the industry has jumped from less than 4,000,000 to over 6,000,000. This horsepower has been put to good use as the manhours per ton of finished steel has decreased from approximately 21.5 in 1940 to less than 18 in 1951. This has been brought about by the use of continuous processes and higher unit speeds.

Mining . . . The present power demand for all mining, including mineral smelting and refining, is approximately 23 billion kwhr per year. It has been estimated that the demand for minerals in the U. S. will increase by about 90% by 1975. Thus a large increase in load is indicated. It is expected that the beneficiation of low grade ores (about 70 kwhr per ton of processed ore) will mean a demand by 1960 of 700 million kwhr.

Petroleum . . . It is estimated that 45,000 mi of new petroleum trunk pipe lines will be installed by 1960. These will require roughly 50 hp per mile in electrical power. By 1955 the planned increase in refinery output will mean about 5 million kwhr increase in power demand.

Chemical . . . This is probably the fastest growing industry and the power demand appears to be increasing about 1 billion kwhr per year.

Rubber . . . This industry consumed about 1.75 billion kwhr in 1951 and is estimated to require about 4 billion kwhr by 1975.

Paper . . . While this industry used about 18 billion kwhr last year (about 700 kwhr per ton), only about 30% of this was purchased from the utilities.

Land Transportation . . . On the railroads the total power consumption for the past 10 yr has averaged about 2.5 billion kwhr per year. The consumption has closely followed the variations in total traffic. The future picture is difficult to predict.

In the case of city transit in the last ten years, the amount of electrical energy purchased has decreased 25.7%, while generated energy has decreased 13.7%. For the future, it appears that rapid transit systems must be employed more to reduce traffic congestions. These would consist of trains of multiple-unit, electrically-propelled cars, and these rapid transit lines would be fed by trolley coach and bus lines on the streets.

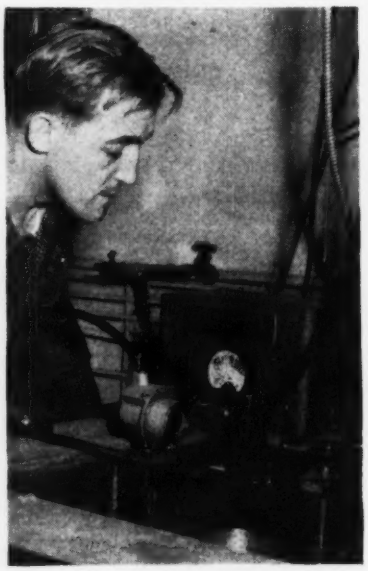
Spectrophotometer Cuts Test Time

L. J. LANGEVIN, Power Engineer, Cincinnati Gas & Electric Co

Checking production items and laboratory research at William S. Merrell Co, Cincinnati, with an infrared spectrophotometer for quantitative and qualitative analysis of pharmaceuticals, has greatly reduced test time and increased accuracy.

Instrument is used for checking production items as well as for laboratory research. Tests which formerly required several hours of chemical analysis can now be made in a matter of minutes with greater accuracy. This is important when production items are being held up awaiting the outcome of the tests.

The structure of the material under test can be identified by the amount of infrared absorption at the various wave lengths.



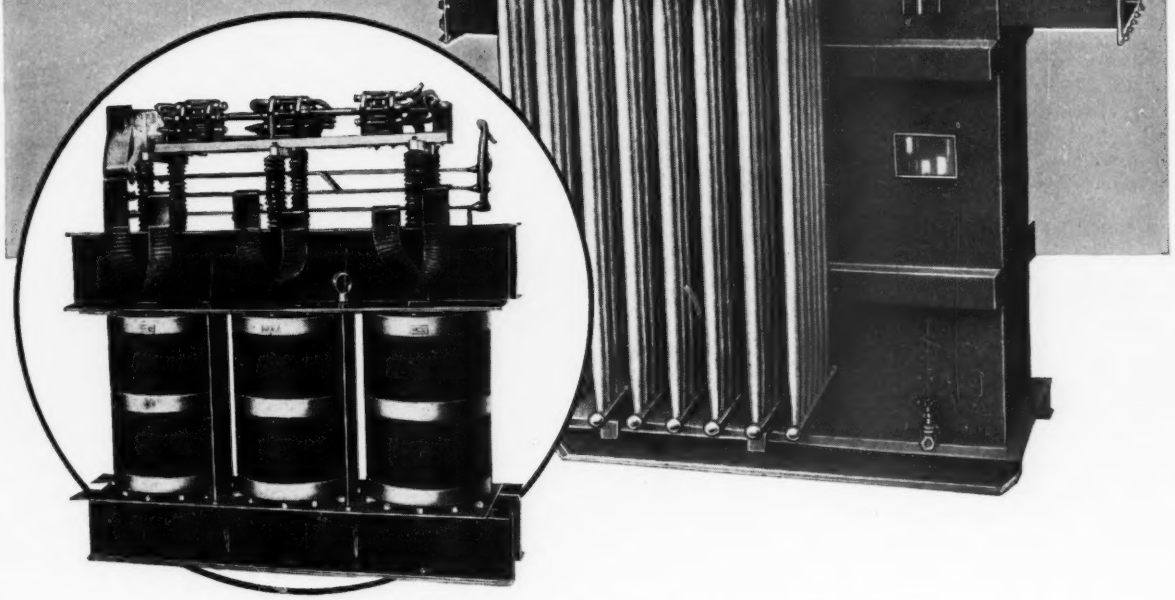
New Detector Aids Temperature Control

Direct temperature measurements of test samples of various steels heated in an induction furnace at Dept. of Metallurgy, Lehigh University, is made possible with a new Leeds & Northrup "Rayotube Detector." Experimental studies on the influence of induction heating on the properties of various steels are being conducted. To control the temperature of a test sample, the detector sights on it through the opening between windings of the induction coil. A special controller automatically records and controls the temperature measured by the detector.

1500 KVA
INDOOR SUBSTATION TRANSFORMER

COMPACT
DEPENDABLE
for
INDUSTRIAL
SERVICE

Uptegraff



This 1500 KVA Uptegraff indoor Unit Substation Transformer is one of three identical units supplied complete—including switchgear—by Uptegraff for a large mid-western industrial firm. The sturdy design of core and coil assembly is clearly evident in the photograph at the left. The strong, rigid tank is designed to withstand eight pounds pressure or vacuum. Transformer is designed for sealed-tank operation, and a super-sensitive electronic leak-detector is used to insure that even the smallest leaks in tanks and bushings are completely eliminated. Transformer is rated at 1500 KVA, 2400-480 volts, 3 phase.

R. E. UPTEGRAFF MANUFACTURING CO. SCOTTDALE, PENNSYLVANIA

Continental Radiant Glass Heating Corp

Electric Heat Reduces Maintenance

Uniform heat provided by electric heating panels has improved employees' efficiency and reduced maintenance at the Delphos Grain & Soya Products Co. office building, Delphos, Ohio, according to F. F. Hiegel, president of the company. Installation of 40 kw in electric heating panels in the 55,000 cu ft one-story building, was made in fall of 1951, and 26,990 kwhr were consumed from Nov. 22, 1951 to Oct. 2, 1952. Total heating cost for this period was $269.90 (at 1 cent rate).

Office is brick and tile construction with no insulation in the outside walls. Ceiling is 9 ft high and is well insulated.

INDUSTRIAL BRIEFS

Heating corn syrup at the Kloss Supply Co., Allentown, Pa., with strip heaters and heating cable maintains temperature of 110 F in 1500 gal tank to facilitate pumping to utilization point. Large tank saves space, labor and time over the previous 50 gal drum deliveries. Syrup is delivered by tank truck at approximately 90 F and 6-kw of strip heaters attached to bottom of tank, controlled by thermostat, raise temperature of syrup. A 400-w heating cable is installed on suction pipe from tank to pump. Paul J. Britt, Industrial Rep, Pennsylvania Power & Light Co., Allentown, Pa.

Radiant heaters, placed between rolls on large flat work ironers helps improve work quality and results in appreciable savings at Long-Hall Laundry and Dry Cleaning Co., Kansas City, Mo. All moisture is driven out of bed sheets and other large items, eliminating reruns of heavy materials and avoiding errors in mixing customers' bundles. A production increase of 28% and man-hour savings of $50.85 per week are obtained for a weekly power cost of only $8.25. Edwin L. Wiegand Co.

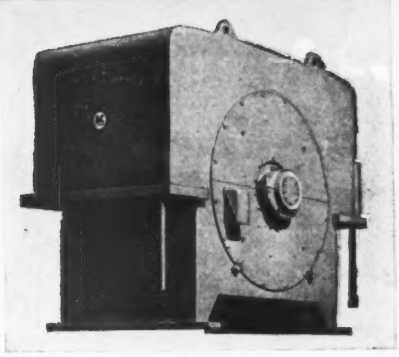
Preheating oil with 5 to 7½-kw sizes of oil circulation heaters improves oil burner efficiency at Sivyer Steel Casting Co., Milwaukee, Wisc. The carbonization of the nozzles has been almost entirely eliminated by heaters placed adjacent to burner, heating oil to 190 F and producing a clean white flame. Annealing oven temperature does not have to be watched so closely since flame and temperature is more uniform. C. H. Swenson, Industrial Power Eng., Wisconsin Electric Power Co.

Pressure steam for autoclave in Water Analysis Laboratory at City of Allentown, Pa., provided by an electric steam boiler, shows large savings over coal fired equipment. When the city shut down and abandoned the use of two large steam driven water pumps, it was necessary to continue to provide 50 lb. pressure steam to the laboratory. Rather than continue the operation of a coal fired boiler, the 5 hp, 50-kw, 3-phase, 220-v electric steam boiler was installed. W. J. Zboyovsky, Industrial Rep., Pennsylvania Power & Light Co., Bethlehem, Pa.

Good lighting increases output per man-hour, lowers accident rate, reduces rejects, lessens absenteeism, and greatly improves worker moral in die shop at Poor and Company, Canton (Ohio) Forge and Axle Works. Adopted to the process needs, relighting consists of continuous rows of fluorescent fixtures providing 55 ft-c general illumination with incandescent local lights on individual machines to highlight working tools. Advantages were so apparent that company proceeded to relight entire plant. Fluorescent lighting was used in machine shop and shipping department. 500-w incandescent lamps in low-bay prismatic reflectors were used in anchor shop and 750-w reflector lamps in hammer shop. G. W. Craiglow, Industrial Power Eng., Ohio Power Co., Canton, Ohio.

NO HOUSING PROBLEM

. . . with this Outdoor Motor



BEST WAY to solve a housing problem is to eliminate the need for housing! That's exactly what the Allis-Chalmers weather-protected motor does. It eliminates the need for a costly building . . . costly in added capital investment, costly in upkeep, and costly in extended construction time.

Proved by Special Tests

We know this weather-protected design can give you these savings . . . plus dependable performance . . . because we've tested it under extreme conditions.

Take the 900-hp, 435-rpm, 4160-volt motor shown above. While running at normal speed and voltage, it was deluged with water at rates up to 40 inches per hour — driven by winds up to 75 miles per hour. This was done repeatedly from all angles. But on inspection, no moisture was detected on the windings of this weather-protected motor.

And other tests checked its effectiveness in keeping out wind-driven fine sand.

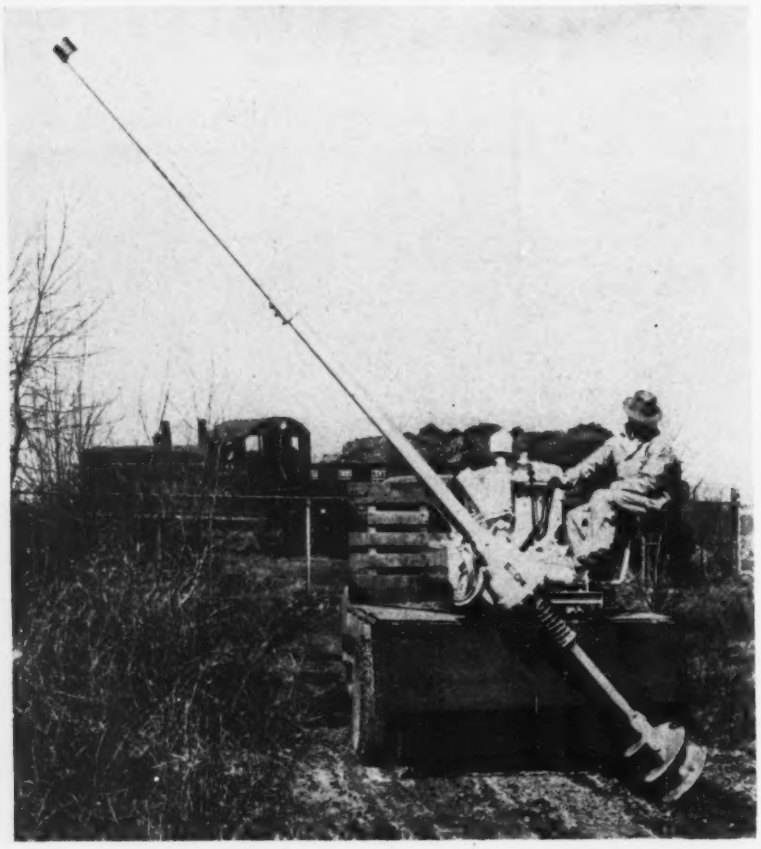
Bulletin Describes Features

The construction features that provide this economical, super-splashproof performance are available in ratings for all major auxiliary drives. For more information, ask your nearby A-C representative for Bulletin 05R7874, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3907

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

NEW EQUIPMENT



Earth Drill

Model Y-1 is self-powered, portable, drills holes 6 to 36 in. dia up to 12 ft deep, vertical or angle. Adjustments are hydraulic, power is industrial gasoline engine. Four speeds forward, one reverse. Unit can mount on 1½ or 2½ ton truck or half-truck.

The Buda Co, Harvey, Ill.

Slot Wedges

Manufactured from glass-bonded mica, Mycalex 410, have smooth surface to speed installation. Expansion and contraction of wedges with temperature is negligible. Claimed to have high thermal conductivity to speed heat dissipation.

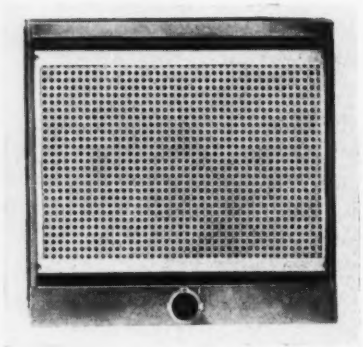
Wedges are impervious to oil, water and organic solvents. Manufacture also claims material to have exceptional dielectric strength and arc resistance. Freedom from carbonization is complete.

Mycalex Corp of America, Clifton, N. J.

Level Indicator

Measures liquid level in boiler. It has 12 in. dial and operates on differential pressure principle; can be mounted on pipe or panel. Available in standard ranges from 0-20 to 0-200 in. of water under working pressure of 2,000 psi. Indicator is tested for safety at 4,000 psi. Manufacturer claims readability is unaffected by scale or boiler compound.

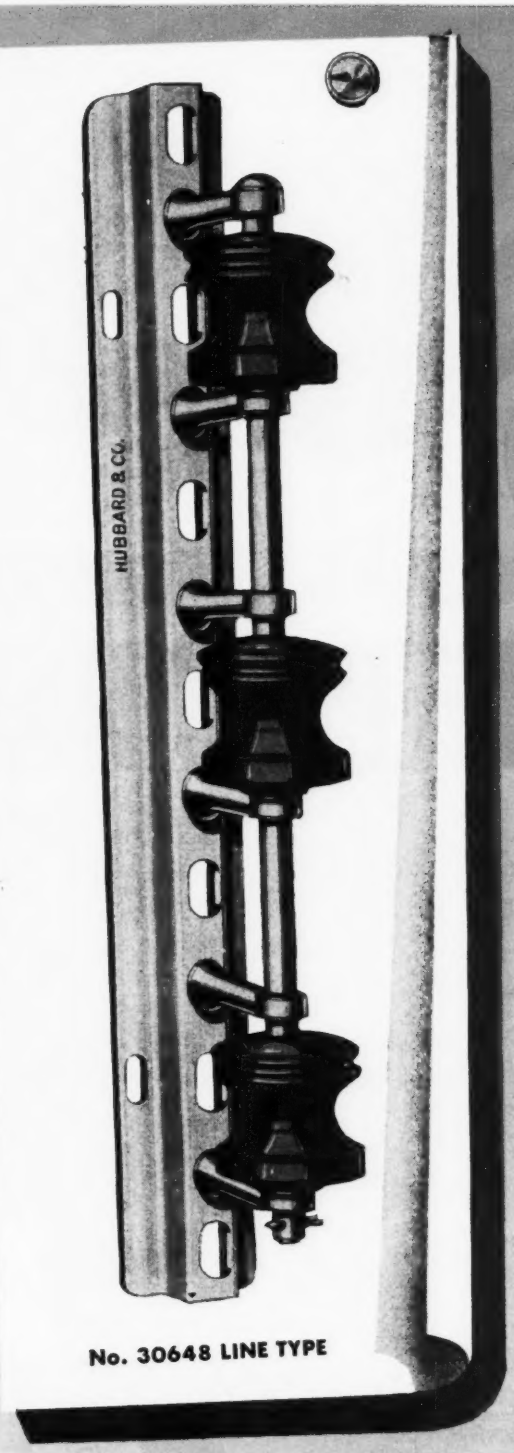
Foxboro Co, Foxboro, Mass.



Radiant Ceramic Heater

Imbedding high resistance wire into special ceramic gives longer infrared wave lengths, it is claimed. Will not ignite cloth on contact, no soot or glow, no danger of fire. Built-in thermostat and pilot light. 24x23 in., 2-in. extension from wall. Rated 9 amp 115 v or 4.5 amp 230 v, claimed to heat 1200-cu ft room in freezing weather.

Heatmore, Inc, New York 3, N. Y.



No. 30648 LINE TYPE

HUB-RAK

THE PRIMARY RACK FOR SECONDARY SERVICES

Hot Galvanized

There are many good reasons why the Hub-Rak has enjoyed top popularity in the years since its introduction. It has been designed for easy mounting and long-life economy, in a range of sizes for every application. Note these features:

1. Forged steel points rigidly attached through the back to form a single unit . . . points smoothly rounded on all exposed surfaces.
2. Heavy back pressed to channel shape for added strength . . . designed to allow back-to-back mounting on poles.
3. Points perfectly aligned . . . rack bolts easily inserted . . . insulators easily replaced.
4. Mounting slots conveniently located to allow insertion of mounting bolts back of insulators at points of greatest strain, or wherever desired.
5. Line and Service Types with extended backs; Line Type also with non-extended back.
6. Finest grade porcelain insulators, designed for protection to conductor while "pulling in" the lines.
7. A rugged unit of heavy steel . . . the finest rack ever produced.

HUBBARD AND COMPANY

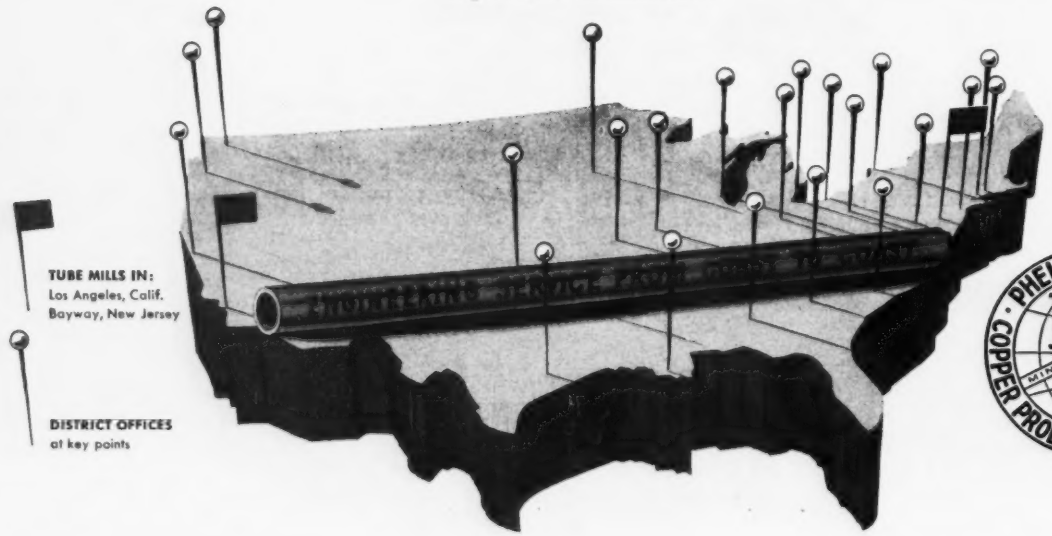
ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

FACED WITH PUT PHELPS DODGE

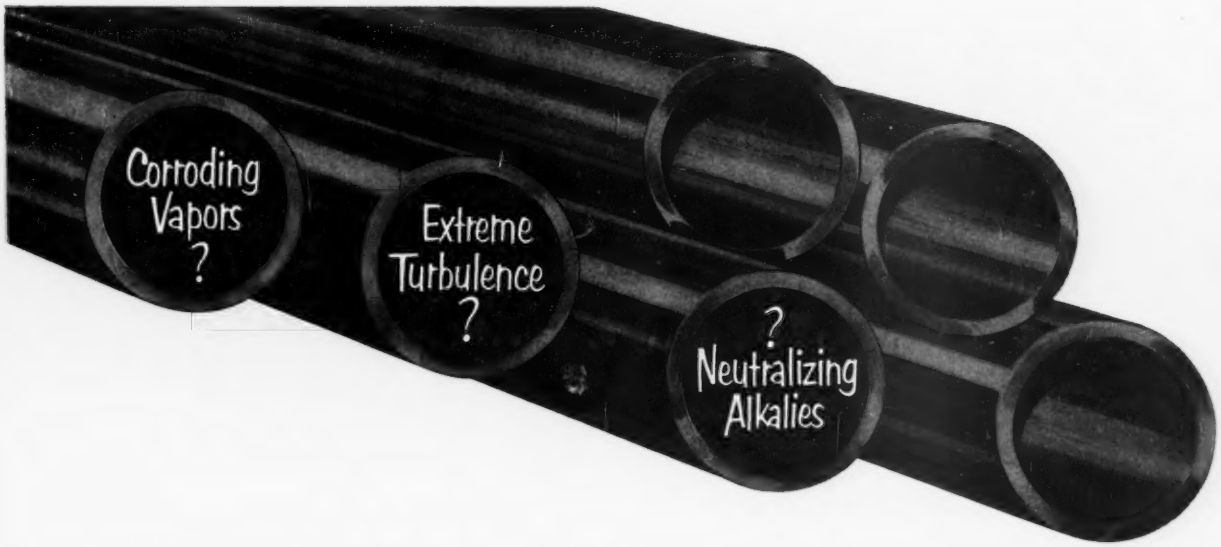
- *Condenser tube specialists* with years of experience in solving tough tube-operation problems.
- *Pioneers* in "trouble-shooting" service nationwide. Research personnel and facilities second to none.
- *Highest quality*—assured by Phelps Dodge Hot-Forged, Extrusion Process and exacting mill control through every step of tube manufacture.



TUBE MILLS IN:
Los Angeles, Calif.
Bayway, New Jersey

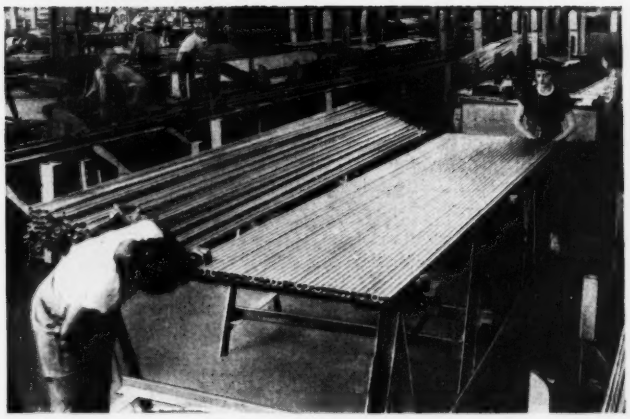
DISTRICT OFFICES
at key points

PHELPS DODGE COPPER PRODUCTS CORPORATION
MINE TO MARKET
P D

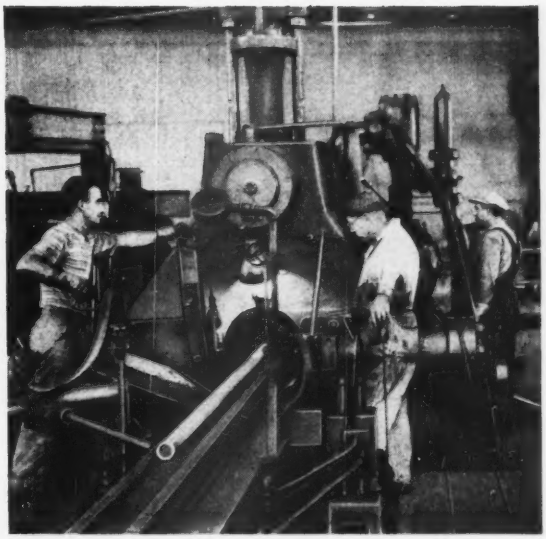


CONDENSER TUBE PROBLEMS?

"KNOW-HOW" TO WORK!



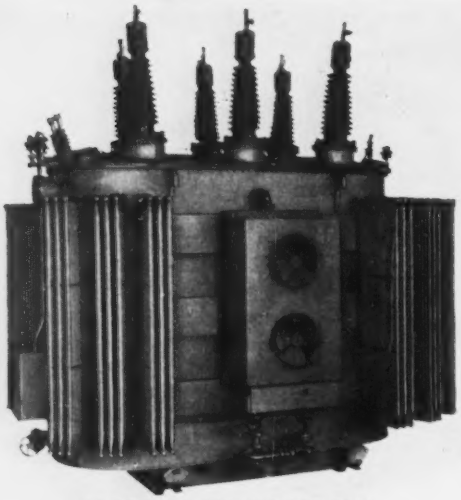
Condenser tubes are pressure tested and inspected for quality control.



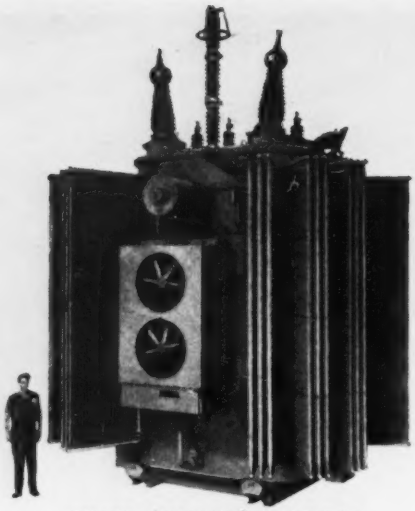
Partially extruded tube—the first step in producing tubes.

PHELPS DODGE COPPER PRODUCTS CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

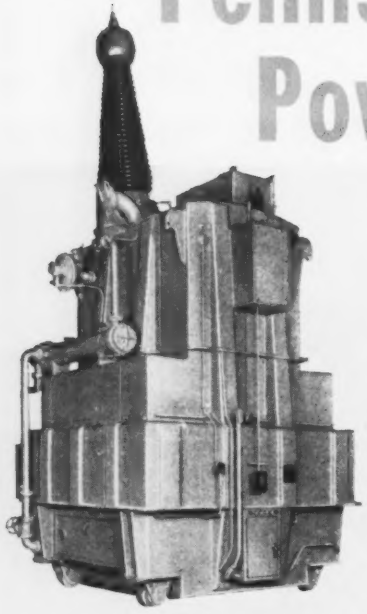


36,000/48,000/60,000 KVA
Auto Transformer. Three-phase, 60 Cycles, 55°C. Rise. 138,000 Grd. Y —115,000 Grd. Y—13,800△ volts.



25,000/33,333/41,667 KVA
Single-phase, 60 Cycles, 55°C. Rise. 110,000—7950/13,800 volts.

Pennsylvania Oil-filled Power Transformers



29,000 KVA
Single-phase, 60 Cycles, 55°C. Rise. 230,000 Grd. Y/132,800 —13,200 volts.

According to NEMA Standards, oil-filled transformers can be cooled in nine different ways. The manner of cooling depends upon many considerations, such as the operating characteristics of transformers using various types of cooling; the availability of large quantities of water; and what is very important, the economics of selecting one type of transformer over another.

The latter consideration may require some study. Auxiliary cooling methods applied to a self-cooled transformer can add, at relatively low cost, as much as 66⅔% additional capacity to the transformer. On the other hand, the efficiency of the transformer and the cost of operating certain types of cooling equipment may be more important considerations than the initial lower cost of a forced-cooled transformer. These are matters that can best be discussed between the engineers who specify a transformer and the engineers who design the transformer.

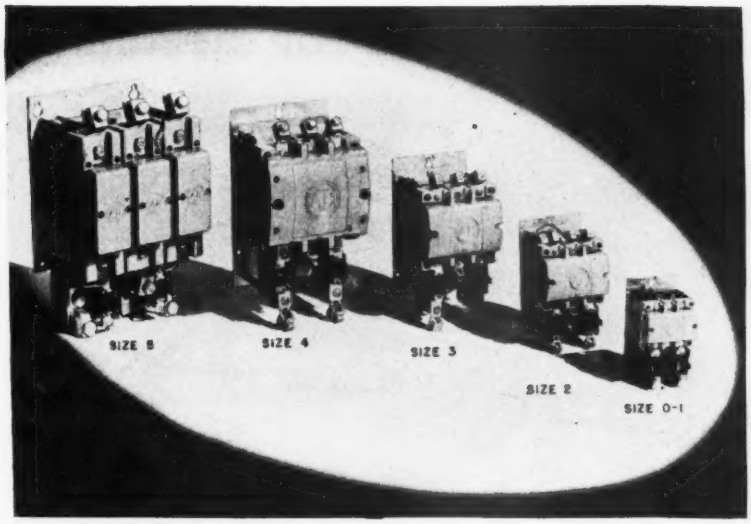
Pennsylvania Transformer Company manufactures transformers of every standard classification and with every type of cooling equipment. If you have a problem in cooling, or for that matter, if you have any transformer problem, you are invited to utilize the experience of Pennsylvania's Engineering Department.

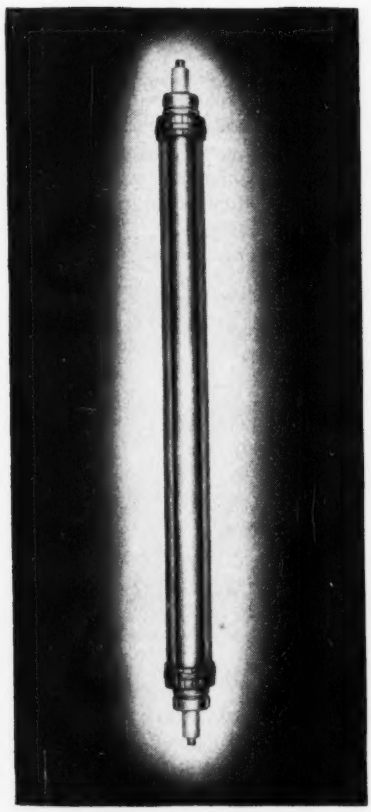
Write for free copy of booklet No. 522 entitled "Economics of Transformer Cooling." This booklet explains the various methods of cooling transformers and discusses their advantages and disadvantages.

PENNSYLVANIA TRANSFORMER COMPANY
A McGRAW ELECTRIC COMPANY DIVISION
CANONSBURG, PA. • *Greater Pittsburgh District*

Motor Controls

This magnetic motor starter features vertical overloads below the contactor. Designed especially for use with Crouse-Hinds M52 Type EPC condulet. Type RA-V starters are lighter, smaller, said to give equal performance. Available sizes 0 to 5.
Arrow-Hart & Hegeman Electric Co, Hartford, Conn.





Safe-T-Aire Lamp

For installation in ducts of air conditioning systems. It emits high-intensity ultraviolet radiation to destroy bacteria, viruses and mold spores. Lamps can be installed in multiple or singly depending on the volume of air.
Hanovia Chemical & Manufacturing Co, Newark, N. J.

Versatile Relays

An added set of contacts on the RC type relay permits locking out the instantaneous-trip elements of the protective relays after the initial opening until the reclosing cycle is completed. Previously an auxiliary relay was required. The relay can also be connected to utilize preclosed contacts for the first one of the multiple reclosures. The relay thus does not add any time delay for fast reclosing of breakers.
Westinghouse Electric Corp., Pittsburgh, Pa.

Accelerometer

Designed for applications in telemetering and designated 24132. Obtainable in resistance ranges from 1,000 to 2000 ohms for any accelerometer measurement up to 30G with special adaptions possible. Maximum current of potentiometer is 10 ma. It is a 1% instrument in performance with good life under vibration. Damping for a 7.5G instrument is 0.5 ±0.075.

Features claimed are: smallness, compactness, hermitically sealed in inert gas, and larger output requiring no amplification in most cases.
G. M. Giannini & Co, Inc, Pasadena 1, Calif.

Test Meter

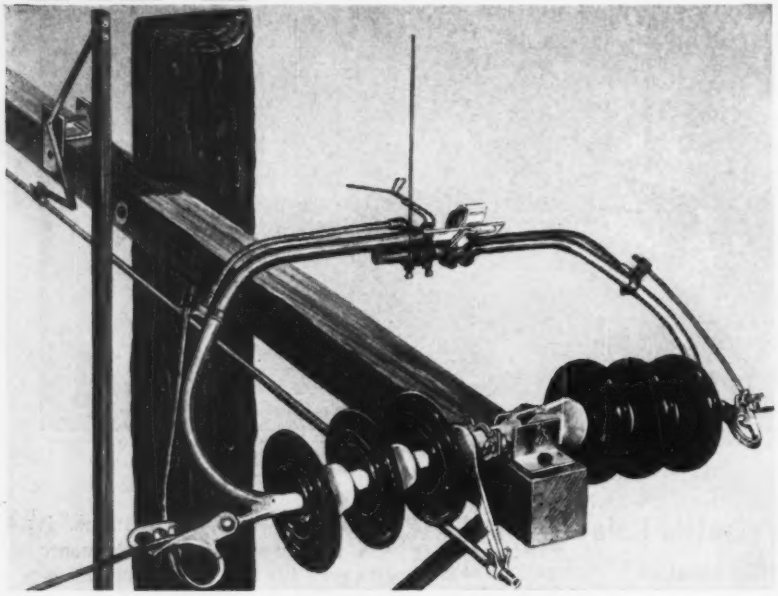
Type CX-8A is designed to check radiated carrier frequency, undulation deviation, and other data of mobile two-way radio systems. Will operate at one or two specified frequencies in 25-50 or 152-174 Mc range; other frequencies available on request. Reading accuracy of the meter claimed to be plus or minus 200 cps; accuracy of reference to the crystal oscillator is better than plus or minus 0.002%.

Designed for field use, the meter weighs 10 lbs. and measures 9½ in. long, 6¾ in. wide and 8 in. high.
Radio Corp of America, Camden, N. J.

Constant-Frequency Control

Designed to hold alternator frequency to 0.001% on motor-generator sets supplying up to 10kw. Available in 50, 60, and 400 cycles, single or

KPF **POLE TOP SWITCHES**



Simple design means more switch ...for less money!

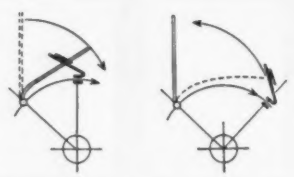
KPF Pole Top Switches cost less because they are simplest in design. They lower installation costs because they bolt on a single crossarm in minutes, require no extra insulators. KPF switches save, too, on upkeep; simple push-pull interphase rods never bind because of crossarm warpage; monel and bronze bearings never need lubrication.

KPF switches may be used in horizontal, vertical or triangular mounting. Free floating, self aligning blades and jaws maintain proper contact under all conditions of switch sag adjustment.

NEW QUICK-BREAK ATTACHMENT FOR KPF SWITCHES

The split-second breaking speed of these new KPF attachments means you can switch many circuits without using expensive circuit breakers. Attachment is available for all KPF switches rated 15 to 69 kv.

WRITE FOR DETAILS

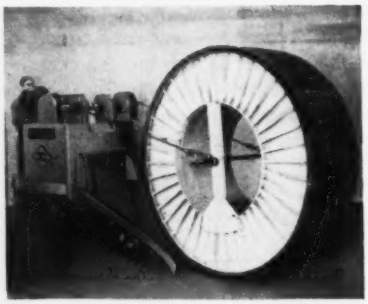


Spring rod winds to full tension as switch opens.

Rod springs clear, breaking contact at high speed.

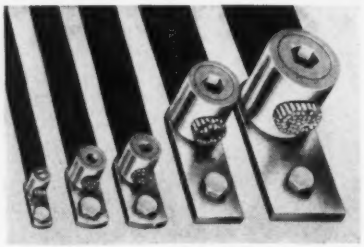
KPF **ELECTRIC COMPANY**
1624 E. Alpine Avenue • Stockton 5, Calif.

three phase. Operates on 115v, 50/60 cycle, uses about 150w. Motor-generator requires 115/230v dc supply.
General Electric Co, Schenectady 5, N. Y.



Powered Platform

Designed to handle reels up to 96 in. dia, weighing up to 20,000 lbs. Overload slip clutch prevents shaft damage. Available with power or hand-wheel steer. All wheel steering for maximum maneuverability. Powered by battery or gas-electric unit. Also equipped with "dead-man" control.
The Elwell-Parker Electric Co, Cleveland 3, Ohio



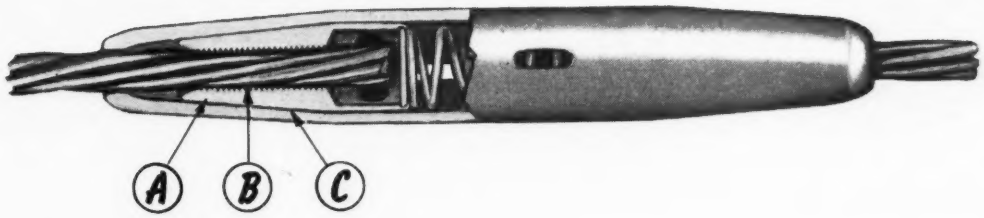
Wire Grips

In only five sizes covering wire from No 14 to No 1,000,000 circ mil cable. Silver coated, cold forged grips are formed from electrolitically pure copper, claimed stronger and smaller than cast copper alloy devices.
BullDog Electric Products Co, Detroit, Mich.

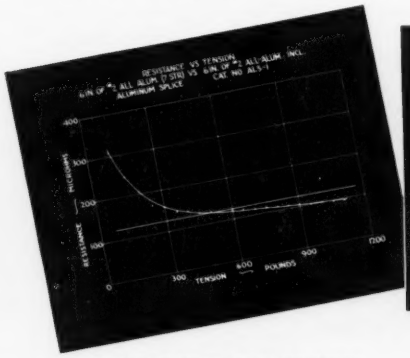
Overload Relay

With sealed silicone time element has time delay for starting, high speed

ALUMINUM "AUTOMATICS"... for ALUMINUM CONDUCTORS

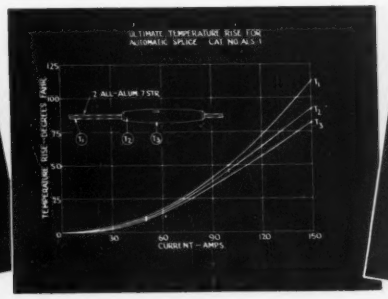


Above is the Fargo Aluminum Automatic Line Splice. The "one-piece" jaw—indicated by "A"—assures permanent alignment of jaw segments for strength . . . holding power . . . and ease of installation. At point "B", the teeth of the jaw penetrate the high resistant aluminum oxide on the conductor surface; at point "C", the external contact surface is wiped clean as tension is applied. This automatic cleaning action assures better resistance contacts, which are kept clean and low by Fargolene* inhibitor, with which all aluminum splices are factory packed. Strengthwise, the splice will develop—on 7 strand all-aluminum—full rated strength of the conductor, and between 70% and 85% on 19 or 37 strand, depending on conductor size and stranding. Accelerated vibration tests show results comparable to the performance of copper splices and conductors.



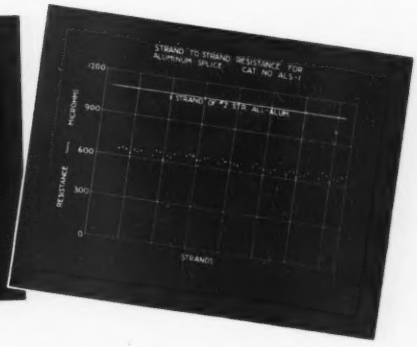
RESISTANCE LOWER THAN CONDUCTOR

Under average operating tension the resistance of the Fargo Aluminum Automatic Line Splice is less than an equal length of cable. The graph shows the resistances of the splice and an equal length of cable plotted against tension.



HEATING LOWER THAN CONDUCTOR

Because of the low resistance shown in Graph 1—plus larger radiating surfaces and larger cross-sectional area—the ultimate temperature rise of the splice is less than that of the cable. (T_1, T_2 and T_3 indicate location of thermocouples for testing.)



ADEQUATE INTER-CONNECTION AMONG STRANDS

Inter-connection between strands in highly essential in aluminum. The graph shows resistances between strands on each side of the splice, as compared with the resistance of an equivalent length of a single strand.

*"*Fargolene*" is a non-corrosive, water repellent, non-conducting grease inert to metals and plating. It remains in position up to 350° and is workable at sub-zero temperatures.

Ask your Line Material Field Engineer for complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

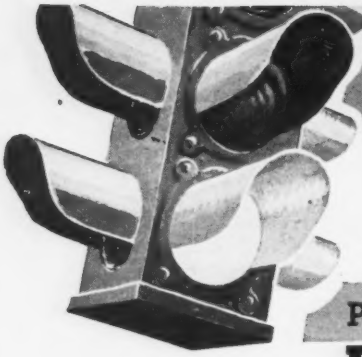
Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

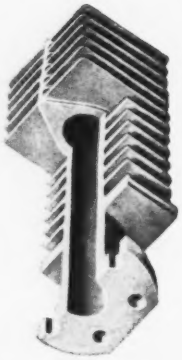
Milwaukee, Wisconsin



GREEN

PREMIER DIAMOND ECONOMIZERS

Good Parts are Essential to a Good Machine . . . Let's examine a Green Fuel Economizer—Type 25—and study the major parts.



FINNED CAST ALLOY IRON TUBES WITH DIAMOND SHAPED SECTION

The diamond shape provides less restricted gas flow; easy cleaning and clearview inspection. The fins provide maximum heating surface in given space.

SEPARATE SUPPORTING AND JOINTING FLANGES

Supporting flange is separate from and independent of jointing flange. Jointing flange is not exposed to hot gases. Through bolts rather than studs are used to connect jointing flanges.

CORRECTLY PROPORTIONED, STRONG CONNECTION BENDS

These are designed to provide needed flexibility with strength. Flanges on tubes, bends and manifolds are accurately machined.

Green specially designed Soot Blower assures thorough cleaning.

Green Type 12 Premier Diamond Economizers—the Steel Tube Units—are made up of equally strong and well designed parts. Send for Bulletin No. 169.

THE GREEN *Fuel Economizer* COMPANY INC.

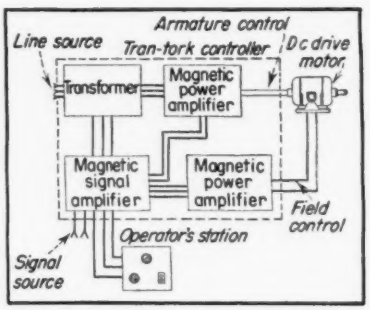
BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

operation, designed for operating under dangerous conditions. Can be furnished with time delay curves to match equipment. Insulated for 440 v service with coil ratings 1 to 100 amp. Overall weight 6 oz.
Heinemann Electric Co, Trenton 2, N. J.

Light Weight Body

For line trucks, are narrow and short for better maneuverability. Designed mainly for maintenance work, the 1½ ton truck is equipped with a 40 ft pole and 6,000 lb winch. Tool compartment doors are sealed with rubber to exclude dust and water.
Gorden Metal Products Co, Lapaz, Ind.



Industrial Drive System

Using magnetic amplifiers instead of vacuum tubes, features automatic regulation and control. No moving parts, minimal maintenance. Available in all power ratings to 200 hp; speed ranges 150 to 1 without constant torque, 30 to 1 under constant torque demands.
Bogue Electric Mfg Co, Paterson, N. J.

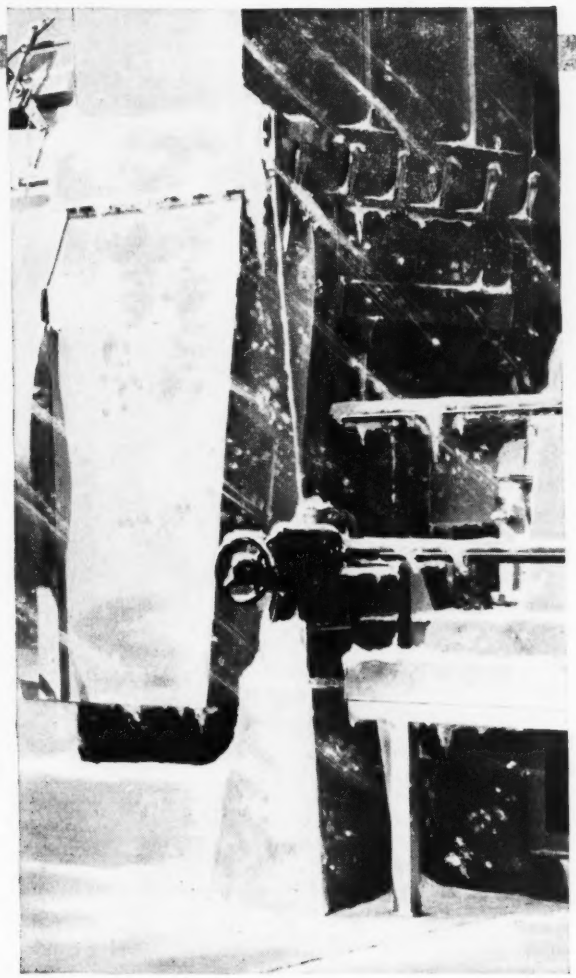
New Battery Separators

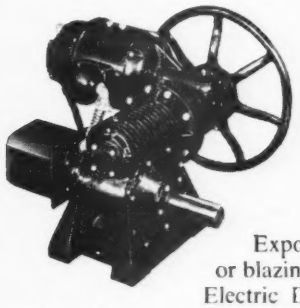
Said to more than double the life of the company's alkaline silver-and-

zinc storage batteries. Battery is 6

L&N ELECTRIC DRIVE UNITS OPERATE

"weather or not"





Exposed to ice, sleet or blazing sun, this L&N Electric Drive Unit provides indoor performance on outdoor applications. Because the drive unit is such a vital link in a combustion control system, the weather-free operation of Electric Drive Units is a real advantage for L&N Metermax Combustion Control on outdoor-type plants.

In addition, the L&N Electric Drive Unit provides many more benefits which make it equally valuable for indoor applications. For example:

Indicates true position—small indicating meters on control board show actual drive unit movement, rather than a loading pressure which *should* produce a movement.

Can't be backdriven—self-locking double worm gear does away with additional locking devices.

Transfers instantly—from automatic to remote manual control; there is no intermediate, reset or balancing position required.

Uses auxiliary power—remote control is as reliable as station auxiliary power. The unit releases itself after a service interruption . . . operator does not have to unlock or reset the various units.

Works manually—geared-down handwheel makes manual operation easy.

Write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Instruments *Automatic Controls • Furnaces*

CAREER OPPORTUNITIES AT L&N

Expansion program of this long-established firm has many features to attract outstanding recent graduates in engineering and science. Opportunities are in sales field engineering, product and application engineering, research, advertising, market development. Widely-respected policies assure recognition of progress and achievement. Address Personnel Manager for interview at nearest of 17 L&N offices.

Jrl Ad NU9-01-463(6)

MARCUS DRY TYPE Transformers

first with Dry Type, Pole Mounted Transformers

first with Quinterra Insulation

NOW... first

with HI-HEAT HI-DIELECTRIC Magnet Wire

Nothing is ever considered so good at Marcus that improvement isn't searched for constantly. Since insulation is the heart and backbone of any transformer, Marcus is proud to announce its use of the first real advancement in Class B insulated magnet wire in 12 years. The combination of Johns-Manville *Quinterra* with DuPont *Mylar* and *Dacron* not only provides exceptional heat resistance but dielectric strength as high as 10 times that of the present industry standard. Failure at such vulnerable points as turn-to-turn and layer-to-layer becomes a virtual impossibility. Moreover, another Marcus first, *Quinglas*, having unusually high physical strength, adds extra protection between layers.

Insulation levels never thought possible or economical with dry type transformers are now available from Marcus, one of the largest manufacturers in the world of dry type transformers exclusively. Capacities from 1 to 3000 KVA, up to 15,000 volts.

Representatives in Principal Cities

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

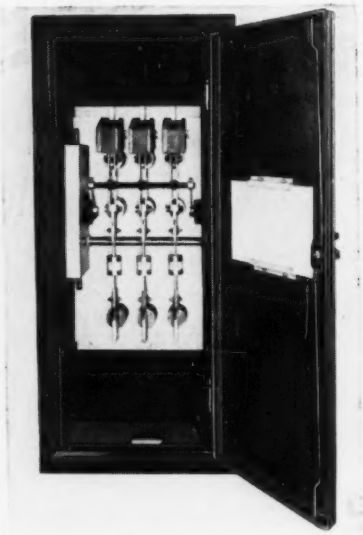
MARCUS

PIONEERS IN THE FIELD OF DRY TYPE TRANSFORMERS

"Mark of Quality"

TRANSFORMER CO., Inc.
32-34 MONTGOMERY ST.
HILLSIDE 5, NEW JERSEY

zinc storage batteries. Battery is 6 times lighter, 5 times smaller than similar capacity batteries, and voltage characteristic is extremely flat, it is claimed.
Yardley Electric Corp, New York 7, N. Y.



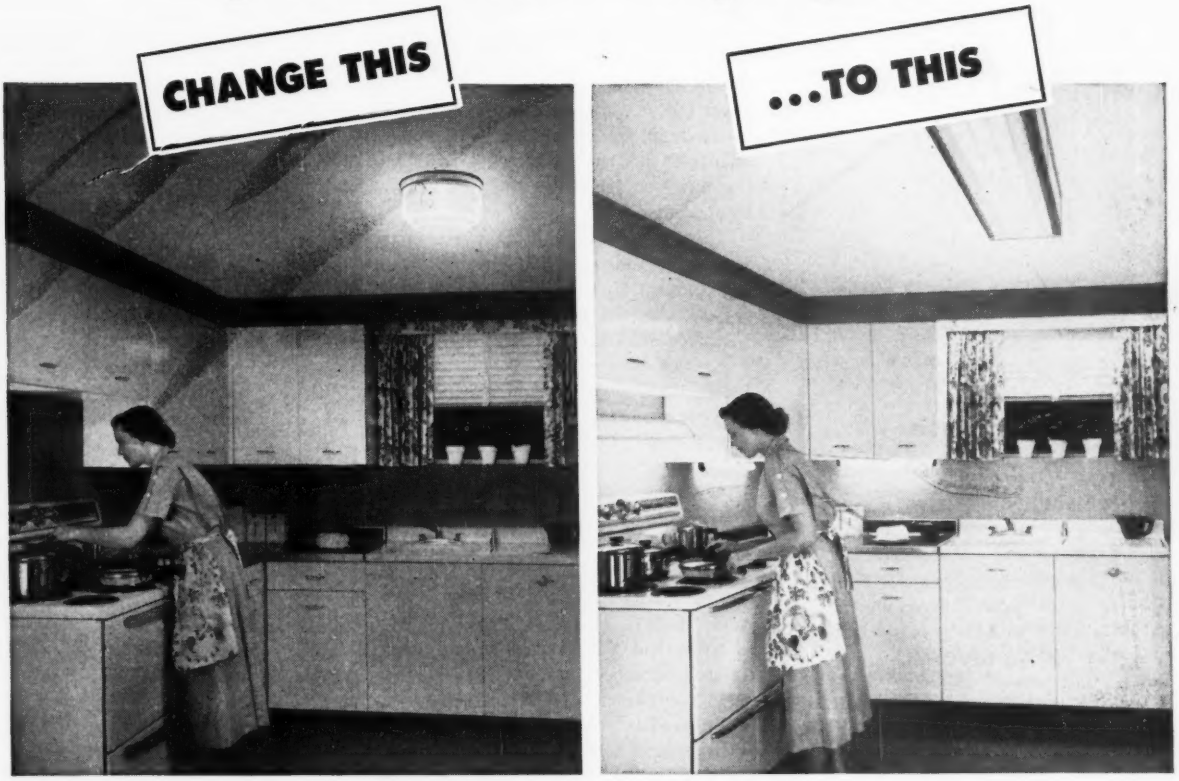
Disruptor Switch

For 600 v ac or dc service, combining functions of disconnect and load interruptor. Quick make and break mechanism, arc quenching chamber. Available ratings 400, 600, 1200, 2000, 3000 amp, two or three pole, with or without provision for fuses.
Delta-Star Electric Div, H K Porter Co Inc, Chicago 12, Ill.

MORE NEW PRODUCTS
about which you should know

Westinghouse Electric Corp, Pittsburg 30, Pa., has a 2,000-mc **microwave system** utilizing a microwave radio (Type FR) and frequency-division multiplex equipment (Type FJ). Carrier is divided into 30 voice channels or equivalent telegraphic functions by multiplex equipment . . . Cornell-Dubilier Electric Corp, South Plainfield, N. J., announces a series of miniaturized, tubular metal-cased **paper capacitors.** They are hermetically sealed in metal cases with floss-to-metal seal terminals and will comply with Specifications JAN C-25 and Mil-C-25A.

February-April Light Conditioning promotion helps you



Complete campaign boosts better lighting for kitchens, offers tie-in opportunity for you

GENERAL ELECTRIC starts off its light conditioning program for 1953 with a full-scale promotion on kitchen lighting. Scheduled for February through April, the promotion provides a solid platform on which you can build effective local merchandising. It's designed to help you coordinate your efforts with those of electrical distributors, contractors and dealers.

The G-E kitchen lighting promotion is backed by full-page, full-color magazine ads, newspaper publicity, counter cards and window displays, and dealer cooperation.

It's your chance to tap important new business. Study after study shows most homes have woefully inadequate kitchen lighting. That means millions of home owners . . . plenty of them in your area . . . are ready-made prospects for new fixtures, and lamp bulbs. By leading the way to the kind of lighting that makes kitchen work easier, less tiring, you'll build goodwill with customers and the trade alike.

Right now is the time to make tie-in plans. Why not begin by promoting proper kitchen lighting to your employees. Notify the electrical contractors in your area. Have your contact men call on dealers and distributors. For more information, contact your nearest G-E sales district office or write General Electric, Dept. 166-EW-1, Nela Park, Cleveland 12, Ohio.

PUT THIS ADVERTISING TO WORK FOR YOU	
SATURDAY EVENING POST	BETTER HOMES & GARDENS
JAN. 31 — FEB. 28	MARCH

GENERAL ELECTRIC

LETTERS TO THE EDITOR

A. L. PIERCE

Oldest Subscriber Renews for Three Years

To the Editor:

I am renewing [my subscription] for three years. I may not last that long. I am 85 years old and have been a manager of electric utilities since 1889 without a major accident. I have had my present job since 1899 and am now building a $4-million steam plant.

I think I have been a subscriber of Electrical World since it was started. My comments are all good—A great help to me always.

A. L. Pierce
General Manager
Borough Electric Works
Wallingford, Conn.

• Old as Reader Pierce is, we doubt that he has subscribed to EW since it was started. When EW first came from the presses in 1874, Alfred Lawrence Pierce was only seven years old. But admittedly he is probably our oldest subscriber in years, and in years on the subscription list. And few men have ever been so active in our industry for so long a time.

In 1886 he went to work for Thomson-Houston Electric Co at West Lynn, Mass. Here, as was the custom in those days, he did a bit of everything. Two years later he began an eight-month period with Robinson-Foster Electric Railway Motor Co, working in the factory at South Peabody, Mass. During this time he installed and had charge of the electric plant and system at Newburyport, Mass.

This took him into the utility field where he served as superintendent and engineer electrician for the South Hadley Falls (Mass.) Electric Light Co for six months in 1889. The next ten years were spent with utilities at Woonsocket, R. I., and Franklin, Mass. He joined the Wallingford (Conn.) system in 1899.

Al Pierce believes it is the duty of every man in the industry to contribute to it through active participation in engineering and industry associations.

Though he received his electrical engineering training and degree following study at night school and by correspondence, he joined the American Institute of Electrical Engineers in 1902 and became a full member in 1912. He is now a life member.

He is also a member of the American Society of Engineers, American Association of Engineers, American Society for the Advancement of Science, American Military Engineers, National Society of Professional Engineers, Connecticut Society of Professional Engineers, and International Association of Municipal Electricians. In these and a number of other societies he has been active as an officer or in committee work.

He has been equally active in civic and fraternal life in Wallingford and the surrounding area.

After reading his biography, the editors of EW had but a single question to ask: When did he ever find time to read Electrical World?

Man Behind the Wrench

To the Editor:

I read Ford Pennell's comment on "Standards for Connectors" published in Electrical World October 27.

The standards give sets of requirements of connectors for clamping force, pull out, etc, in terms of in./lbs of torque on split-bolt connectors from 120 to 900 in./lbs.

It has been estimated that an average lineman on a pole will exert 400 in./lbs with his normal wrench, between 30 and 40 lbs pull on the end of his arm. If we assume an average of 35 lbs pull this means that he must carry a set of wrenches from 4 in. to 26 in. in length.

This of course is exaggerated, but would it not be more practical in setting up standards to get within the range of actual linemen's conditions on a pole rather than under purely hypothetical laboratory test conditions? Should not manufacturers design their connectors so that the lineman's personal strength and operations govern the torque applied? Perhaps many small split-bolt connectors get planted in the soil because the lineman's wrench is too big for the connector, or the standard clamping force is never reached on large connectors because his wrench is not long enough.

Compression type connectors solve this great variable by using tools of fixed leverages for various sizes of connectors, regardless of the size of the man behind the wrench.

This problem is important because, more often than we think, burned and loose conductors, mechanical and electrical failures, occur because of personal limitations rather than because of connector defects.

Fred M. Reiter
Material Research Engineer
The Dayton Power & Light Co
Dayton 1, Ohio

Warm Up to 'Electric Fire'

To the Editor:

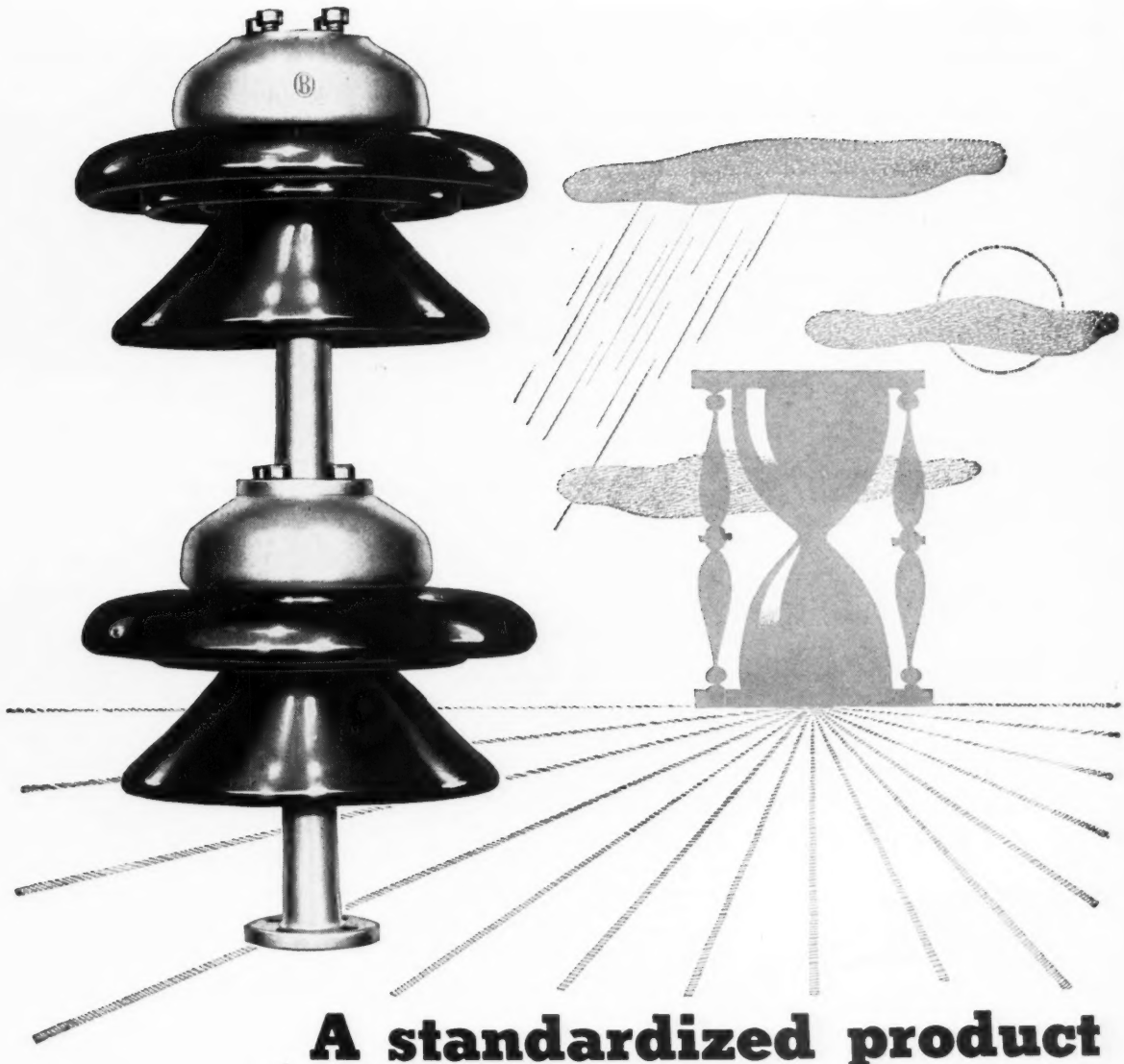
I have read with great interest an article entitled "Future of the Electric Fire, Where the Critics Are Wrong," which you published in the December 8 issue, page 41.

In view of the fact that we are pioneering an industry of controlled electric heating in Canada, and that so great a contribution must be made by a publication such as yours which is greatly instrumental in filtering through information helpful in uncovering the true facts on power problems and the somewhat controversial subject of electric glassheating, I would very much appreciate your cooperation in getting me in touch with Mr. A. W. Moss who wrote the above mentioned article.

Thank you in anticipation for directing this letter through the proper channel.

William E. White
Sales Manager
Glassheat of Canada Ltd
Montreal 2, Canada

• Mr. White's letter is on the way to Mr. Moss.



A standardized product - that includes value!

Because a station insulator is surrounded by national standards for dimensions, strength, and electrical characteristics, does this mean they are all on a par? If this were true, they would all give the same service, and you know they don't!

Standards apply only to the "as manufactured" condition of a unit. They necessarily relate to the *first day* of an insulator's life -- while value is figured on the *last day.*

So far, thousands of O-B station insulators have put as much as 35 years behind their first day, with the last nowhere yet in sight. Their overall adequacy is unimpaired.

Your own experience tells you this isn't a standard condition and doesn't lend itself to a set of detailed specifications. You can get this assurance of performance quite easily, however. Just put "O-B" on your station insulator requirements.

Ohio Brass

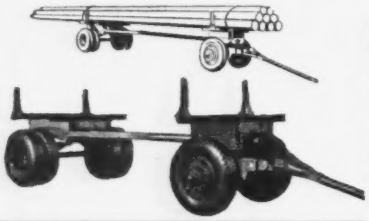
MANSFIELD OHIO, U.S.A.

4227-H

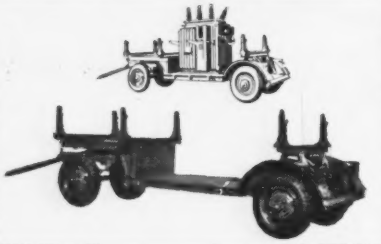
Notes on Eagle Equipment — Designed to save man-hours and money

TRAILERS

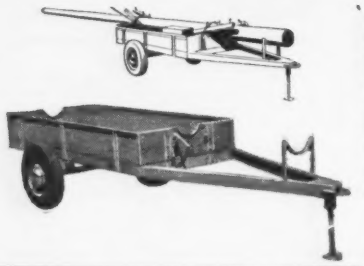
...IN A WIDE RANGE OF SIZES AND TYPES



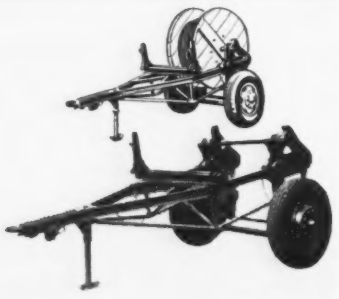
ADJUSTABLE LENGTH POLE TRAILER: easily adjusts to accommodate poles up to 90 ft. long — a big trailer that does a big job. Center pole telescopes. Trails smoothly. Equipped with electric brakes on rear wheels. Get complete information on Eagle Trailer Model 6450.



FOUR-WHEEL LO-BED TRAILER: for easy loading and hauling of heavy bulky units, also suited to pole and general purpose hauling. Five ton capacity, overall length 25 ft. 8 inches. Distance ground to low platform only 25½ inches. Equipped with electric brakes on rear wheels. Get complete information on Eagle Trailer Model 6441.



LIGHT-DUTY CARGO AND GENERAL PURPOSE TRAILER: light-duty, 1-ton capacity trailer for hauling one or two poles, cross-arms, pole hardware, etc. Has pole saddles front and rear and removable end boards. Get complete information on Eagle Trailer Model 7163.



COMBINATION CABLE REEL AND POLE TRAILER: complete with bolsters, stanchions, cable reel saddles. Quickly converted into a pole trailer by removing cable reel saddles and installing bolsters. A practical dual purpose unit, requiring only one trailer license. Get complete information on Eagle Trailer PCP — W-PCP series.

Send today for the complete catalog of Eagle Line Construction and Maintenance Equipment — a useful reference book.

EAGLE

BODIES • TRAILERS
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EQUIPMENT ENGINEERED BY AND FOR UTILITY MEN EXPRESSLY FOR THEIR NEEDS

Distributed by GraybaR

EAGLE MANUFACTURING CO., Appleton, Wis.

Division of The Four Wheel Drive Auto Co.

WHAT THEY'RE SAYING

At Industry's Meetings

"Man Hunt" for Talent

GWILYN A. PRICE, president, Westinghouse Electric Corp, before the 3rd annual Fellowship Dinner Meeting of Carnegie Institute of Technology Alumni at Pittsburgh, Pa.

American industry is engaged in a determined man hunt for managerial talent, a hunt for tomorrow's managers who will face graver problems and greater decisions than ever before. At Westinghouse, our plans for the choice of management men must be just as careful, just as systematic, as those for the design of our new products, the schedules of our production, and the extent of the facilities that we will need.

Grocer's Item

EDWARD R. MAIZE, JR., manager of chain store sales, Westinghouse Lamp Division, before the National American Wholesale Grocers Association at New York City

The electric light bulb is rapidly becoming a grocer's item, not only because it has a rapid and profitable turnover, but because it is now recognized as an item that the housewife will buy in the course of her daily household marketing.

Pattern of Thought Changed

WALTER L. HUBER, president of the American Society of Civil Engineers, before their annual business meeting, at New York City

With the great developments of the past century has come a change in the pattern of thought of our people. Perhaps the engineer and his works have had much to do in bringing this about. Certainly he has done most to change the surroundings and the way of life for all. Has he created a Frankenstein which he cannot control? I think not.

While these changes have been developing, the engineer has been slow to appraise the changed status of the thought of the nation. Accumulations of capital beyond those formerly visualized are necessary for constructing the great works now required. Many of these accumulations are thought,

Pull 12 Conductors Where You Have 7 ... Use ROCKBESTOS PNR® Control Cable

Conventional 7-conductor #9 AWG in 1¼" conduit

PNR 12-conductor #9 AWG 1¼" conduit

- **YOU USE THE SAME SIZE CONDUIT**
- **YOU SAVE STEEL**

Because Rockbestos PNR Control Cable is 46%* smaller in area than competitive control cables, it enables you to put 12-conductor PNR where you would use 7-conductor cable. This means you save critical steel conduit and fittings, because you put more conductors in a given conduit. Write for the PNR story.

QUICK FACTS ABOUT PNR

- 46% smaller area* . . . 28% smaller diameters*. Use smaller conduit and fittings or put more conductors in present conduit.
- Dielectric breakdown . . . over 40 times operating voltage.
- Lighter and smaller. Easier to handle, store, ship, pull through conduit.
- Flexible to —25°C (—13°F). No cracking!
- Rated 600 volts . . . conductor operating temperature 75°C (168°F).

*Average determined by comparison with competitive control cable.

ROCKBESTOS PNR

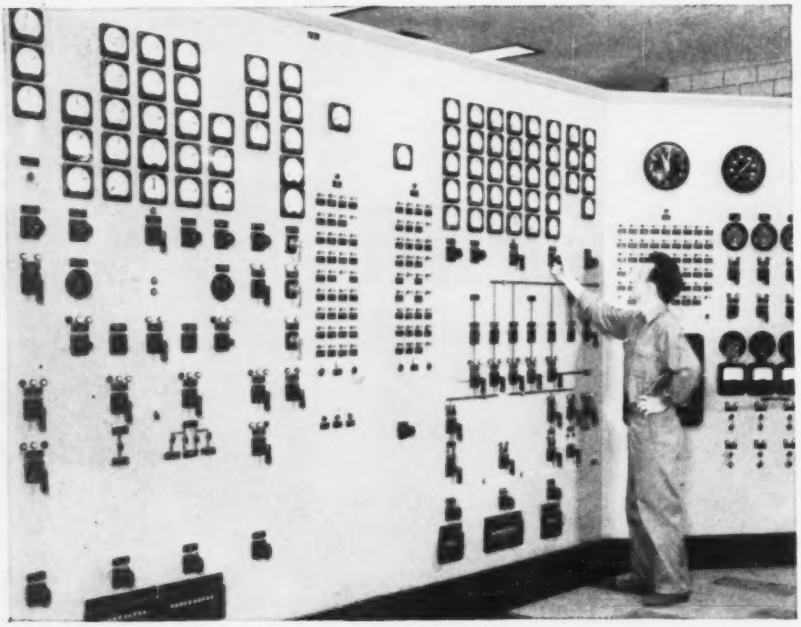
... another different, better cable by

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.

the originators of **A.V.C.®**

New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
Los Angeles • Oakland, California • New Orleans • Seattle

Easy-reading K-24 instruments



Give you more freedom in switchboard design

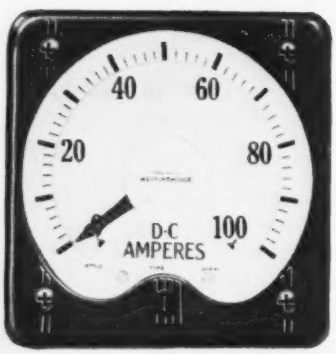
Sometimes the instruments on your switchboards can have significant effects on the overall design. The power station above is a good example of creative switchboard design with the right instruments.

The Westinghouse Full-View K-24 instruments on the board are exceptionally readable—even from sharp angles. Thus the designer was able to stack them up high on the board. Old-style instruments aren't easily read from this angle so they would have been set lower and spread out—resulting in a longer, less compact board.

You can see the results of this superior readability. The operator can see many more instruments from where he stands. This makes him more efficient and he can act faster when action is needed. And because the whole unit takes up less space and material, the overall cost was lower.

Westinghouse supplies a complete, co-ordinated line of electrical measuring instruments for every switchboard application. Write now for booklet, B-4695, "Getting A Full Measure". Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

J-40427



You can read the K-24 accurately under any lighting conditions and from very wide angles—up to 50°. Shadows, glare and parallax are practically nonexistent. It is a triumph of optical engineering.

YOU CAN BE SURE...IF IT'S Westinghouse

EVERYTHING YOU NEED IN METERS AND INSTRUMENTS

often without reason, to be beyond the range of private capital; and so more and more has it become the habit to turn to the public purse—national, state, or local.

Unfortunately, it is apparent that much of the direction of public spending is done without due consideration of economic and engineering fundamentals.

Copper Shortage

H. C. MOSES, Chicago district manager, Thomas & Betts Co, before 250 representatives of industry at Chicago, Ill.

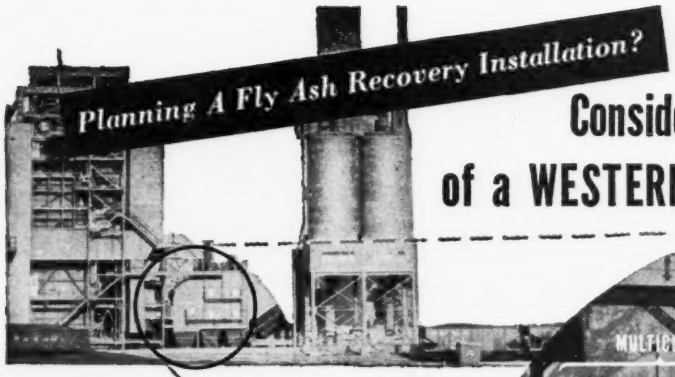
Because of the copper shortage there is an urgent need for knowledge about aluminum electrical wire and cable. The performance of the aluminum conductor will equal that of copper. There are five key difficulties and ways to meet them in order to successfully use aluminum to conduct electricity. The difficulties concern its electrical conductivity, oxide coating, susceptibility to mechanical damage, expansion and contraction with temperature change, and electrolytic action.

The Engineer Today

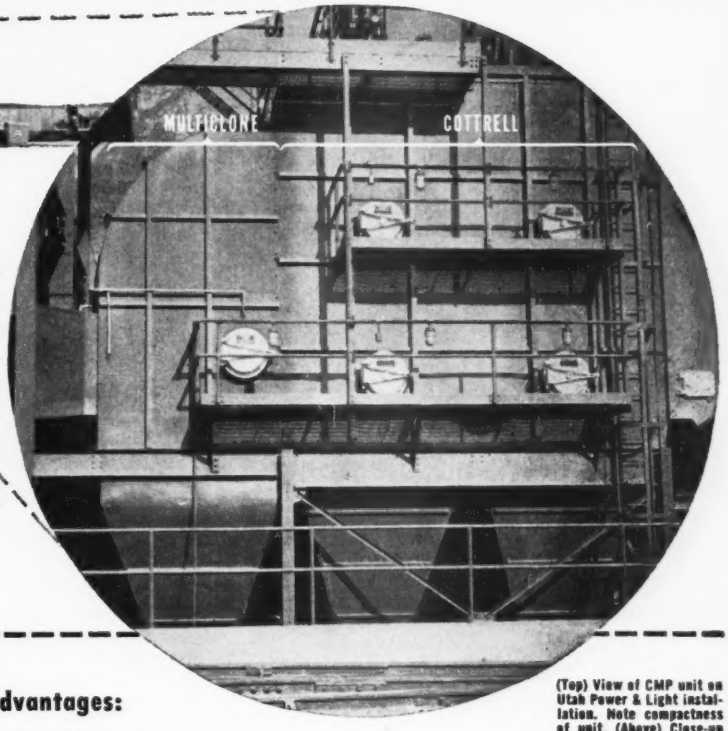
JOHN L. McCAFFREY, president, International Harvester Co, before the formal dedication of the company's motor truck engineering building and laboratories at Fort Wayne, Ind.

For a long time many people seemed to regard the engineer as a fellow who could span the broadest rivers with his bridges, run a railroad through the highest mountains, build ships to ride out the roughest storms, and design machines that performed miracles. But when it came to promoting himself, he didn't operate with the same bold strokes. Somehow, in the public mind, the engineer himself didn't stand forth in perspectives that matched his accomplishments.

But any such impression is fast being corrected. And the engineer himself is having a great deal to do with it. He is becoming more vocal, more expressive—more promotional if you please. I think you will find evidence of it right here today with these fine engineering associates of ours. You'll see that they have acquired the art of showmanship, as a means of attaining wider public understanding of their work and their accomplishments.



Consider these important advantages of a WESTERN PRECIPITATION CMP UNIT!



IF YOU are planning the installation of any type of fly ash recovery equipment—mechanical or electrical—it will pay you to investigate the extra advantages to be gained by installing a CMP Unit designed, engineered and constructed under *one* responsibility by Western Precipitation Corporation—*leaders in both electrical and mechanical recovery fields!*

(Top) View of CMP unit on Utah Power & Light installation. Note compactness of unit. (Above) Close-up of same installation.

Combines Mechanical and Electrical Advantages:

A CMP (Combination Multiclone-Cottrell Precipitator) Unit combines—in one compact installation—both mechanical and electrical recovery principles, so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally cleans the gases of the larger and heavier fly ash particles (down to a few microns in diameter) . . . and the COTTRELL Precipitator then electrically removes the very small particles remaining in the gases. This combination arrangement has important advantages:

1. Using the MULTICLONE for cleaning out the heavier particles permits the bulk of the recovery operation to be performed with relatively low-cost equipment.

2. Using the COTTRELL for final clean-up insures unusually high recovery efficiency—approaching theoretically perfect, if desired—with a high efficiency, compact Precipitator unit.

3. Each type of unit—MULTICLONE and COTTRELL—can be arranged for its most efficient application. MULTICLONES may be connected to each separate boiler, if desired, and their draft requirement cut out when the boiler is down . . . while a central COTTRELL handles all gases and operates at higher efficiencies, with continued low power cost, when one or more boilers are down.

4. During soot-blowing periods, or while warming up cold boilers, the MULTICLONE efficiency usually increases, preventing overloads of detrimental carbon from reaching the COTTRELL.

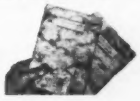
Only Western Precipitation Combines Multiclone and Cottrell "Know-How"—In ONE Organization!

A vital factor in obtaining maximum efficiency and economy in CMP installations is the proper balance of mechanical and electrical recovery equipment to the individual requirements of *each* application. Western Precipitation is unique in that it not only pioneered the commercial application of COTTRELL Electrical Precipitators over 43 years ago, but also has been a leader for many years in the *mechanical* recovery field with its widely-recognized MULTICLONE Collectors.

Result—Western Precipitation has the all-important "know-how" and experience in BOTH fields . . . knows from first-hand experience how to fit the *right* equipment in the *right* place, to do *your particular* job . . . and can provide the complete installation under ONE responsibility and ONE overall guarantee!

Let Our Experienced Engineers study your recovery requirements and make recommendations on the equipment best suited to your operations. A wire, phone call or letter to our nearest office places this unique "Know-How" at your service, without obligation!

Send for descriptive literature!



WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

NEWS ABOUT PEOPLE

Hyer Named to Presidency . . .

. . . of Southern Colorado Power Co. Utility's top official formerly filled the post of executive vice president

David B. Hyer, Jr, executive vice president of Southern Colorado Power Co, has been elected president of the utility. Hyer's elevation followed the resignation of J. B. French, who in accepting the presidency two years ago did so with the understanding that at the first of 1953 he would be permitted to become a consultant to the board. French will remain on the utility's board of directors and will continue as a member of the executive committee.

DAVID B. HYER, JR

During his association with Southern Colorado Power, French continued as president of the Black Hills Power & Light Co.

Named to Board . . . Hyer has also been elected to the board of directors, filling the vacancy caused by the resignation of M. G. Lord. Lord, however, will continue in the post of vice president.

Before joining Southern Colorado Power, Hyer was commercial manager of Florida Power Corp, which he joined in 1927. When he was with Florida Power, he held a number of sales and engineering posts, including those of new business supervisor, supervisor of engineering, and assistant superintendent of transmission and distribution before becoming director of industrial development and power sales in 1945.

French, who started his utility career in 1912, once served as general manager of Dakota Power Co. He was named its president in 1937 and also became a director of General Public Utilities Co, then parent company of Dakota. In 1941 French organized Black Hills P&L, which combined Dakota Power with other South Dakota properties of GPU.

French is now serving as president of the North Central Electric Association. He also was president of the Rocky Mountain Electrical League in 1946.

Fairman, Skinner Elected VPs of Kentucky Utilities

Floyd I. Fairman and William H. Skinner have been elected vice presidents of Kentucky Utilities Co. The company has also appointed A. A. Tuttle, secretary and treasurer, to the board of directors to fill the vacancy caused by the death of Washington Reed, vice president (EW, Dec. 15 p 186).

Served as PUAA Head . . . Fairman, director of customer service and advertising, joined Kentucky Utilities in 1926 as a district engineer in western Kentucky. He later served as division engineer, division commercial manager, and industrial engineer. He was

FLOYD I. FAIRMAN

WILLIAM H. SKINNER

appointed to the director's post in 1942. He is a past president of the Public Utilities Advertising Association.

Skinner, director of rates and contracts, began with the Kentucky utility in 1926. He first started as an engineer in transmission line construction and later served as company statistician. In 1934 he was made rate engineer.

Tuttle has been secretary and treasurer of the company since 1914, two years after Kentucky Utilities was formed.

Collins and McCormac Are Assigned New Duties

Niagara Mohawk Power Corp has assigned new responsibilities to Vice Presidents William L. Collins and Leland D. McCormac.

Collins has assumed new system-wide duties and will have offices in Syracuse and Buffalo. In addition to new expanded system activities, he will also serve as a consultant to the company's purchasing departments. The utility purchasing is being centralized in its main office at Syracuse, but it will continue to have purchasing departments in Buffalo and Albany.

McCormac has been made vice president in charge of system purchasing. He will continue his headquarters at Syracuse and will relinquish his present duties as vice president in charge of system commercial operations.

Collins, who joined a predecessor

Steel-Service Team

In there - - Pushing

Now more than ever the help of an experienced steel-service organization is especially valuable. That's why it may well pay to get in touch with the nearest Ryerson office or plant.

Not that we can *always* furnish the steel you need—much as we would like to, and hard as we try. But, with controls relaxing a little and a few steel products coming into better supply, there are more opportunities for experience and ingenuity to take over. And experience, ingenuity—and the will to help are never in short supply at Ryerson.

Your nearby Ryerson plant is staffed with specialists on carbon, alloy and stainless steels who are always ready to work with you. Often they can suggest practical alternates when the steel you need is not available. And back of the Ryerson plant nearest you stand the resources of fourteen other Ryerson plants, making up the nation's largest steel-service organization. So when a kind or size is not on hand locally, we may be able to ship it from another plant.

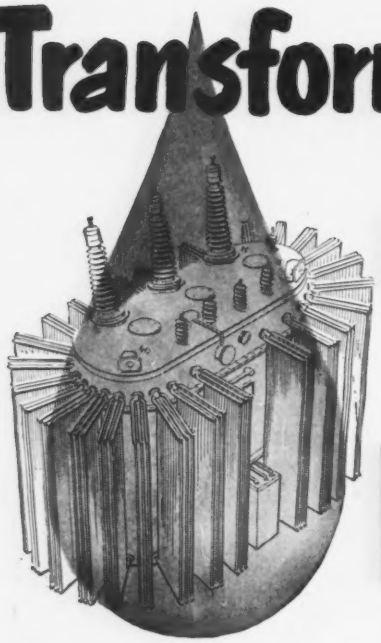
With all Ryerson plants cooperating, and with Ryerson specialists helping to make the most of available steel, we are usually able to maintain service in spite of the current situation. So we suggest that you check with us regularly for all your steel requirements . . . There is nothing too difficult when it comes to working with a Ryerson customer.

Principal Products: Carbon, Alloy & Stainless Steels — Bars, Structurals, Plates, Sheets, Tubing, Machinery & Tools, Etc.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Transformer Oils last longer with DBPC



WHEN Di-tert-butyl-para-cresol (DBPC) is added in liquid form to transformer insulating oils, their resistance to oxidation is increased and their useful life is greatly extended.

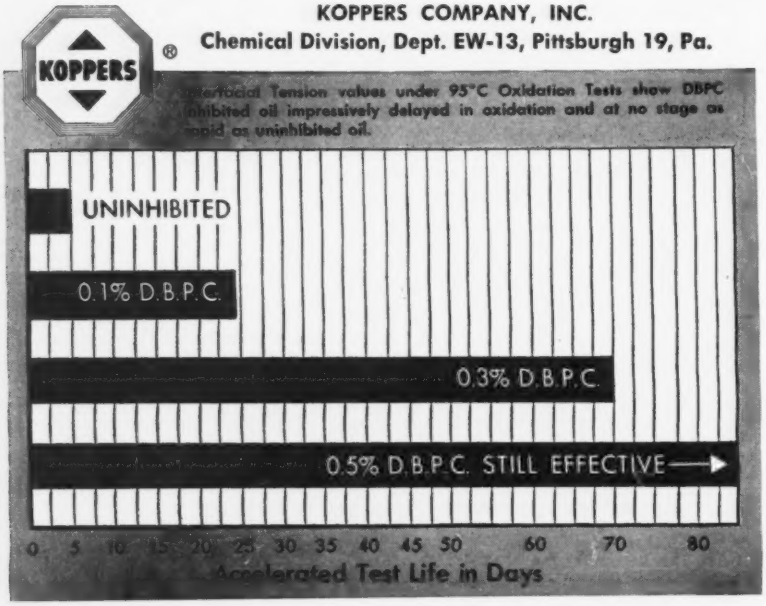
The value of Koppers DBPC as an inhibitor for new or reclaimed oil has been proved. Actual use has confirmed the accelerated oxidation tests shown below. Further, many manufacturers of transformers now endorse the use of DBPC, and most major suppliers of transformer oil will, on request, furnish new oil that has been inhibited.

When ordering new or make-up transformer oil, make certain it is inhibited. And use DBPC to prolong the life of your reclaimed oil. The savings you'll get will be worth your while.

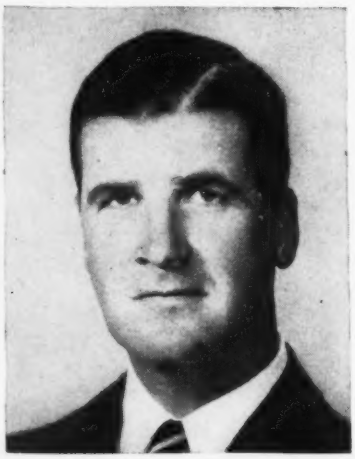
If desired, we can furnish a compounded oil solution of DBPC called Impruvol 20. Impruvol 20 can be used with simple equipment. Its application presents no more problem than the application of insulating oils themselves. Order Koppers DBPC or Koppers Impruvol 20; the choice is yours.

KOPPERS ®

KOPPERS COMPANY, INC.
Chemical Division, Dept. EW-13, Pittsburgh 19, Pa.


Interfacial Tension values under 95°C Oxidation Tests show DBPC inhibited oil impressively delayed in oxidation and at no stage as rapid as uninhibited oil.
UNINHIBITED
0.1% D.B.P.C.
0.3% D.B.P.C.
0.5% D.B.P.C. STILL EFFECTIVE
0 5 10 15 20 25 30 35 40 45 50 60 70 80
Accelerated Test Life in Days

company in 1905, has been a vice president of Niagara Mohawk since 1950. McCormac started with the system in 1926 and has also served as a vice president of the utility since 1950.



JAMES H. KNOWLES

Hubbard & Co Appoints James Knowles President

James H. Knowles has been elected president of Hubbard & Co, Pittsburgh. The company has also announced the election of Joseph V. Smith as chairman of the board and chairman of the executive committee.

Knowles, who in 1949 was appointed assistant to the president of Hubbard, joined the company in 1947. Smith, who was named president of the firm in 1947, started with Hubbard in 1915.

Schrock Is Elevated

R. G. Schrock has been advanced to the position of executive vice president of Euclid Electric & Manufacturing Co, Madison, Ohio. Schrock, who started with the company 30 years ago, has been a vice president of the company since 1936.

Names 2 Vice Presidents

McGraw Electric Co's Clark Division, Chicago, has appointed Scott Campbell as vice president and general manager and Frank B. Knight as vice president in charge of production. Campbell has been with Clark Division since 1946 and Knight since 1948.

SOLVE DISTRIBUTION PROBLEMS
with SORGEL Substations and Power Centers

"Packaged" Units for Indoor Installations

Speeds Expansion and Earlier Production. The complete Substation is shipped in one or more factory-assembled units, on a substantial steel base, completely wired and tested, ready for installation and final connection. No need of buying separately the transformers, switches, fuses, insulators, circuit breakers, and other accessories, and then assembling and connecting them on the job.

Lower Maintenance Costs. Because dry-type transformers are used there is no liquid to check, replenish or replace. No fire Hazard. All parts are easily accessible.

Flexibility for Future Conditions. Being all self-contained in a single unit, the Substation can be readily moved from one location to another.

Saves Copper. The Substation can be placed near the load center, so that shorter secondary cables and small primary lines can be used. Improved voltage regulation and reduced line drop.

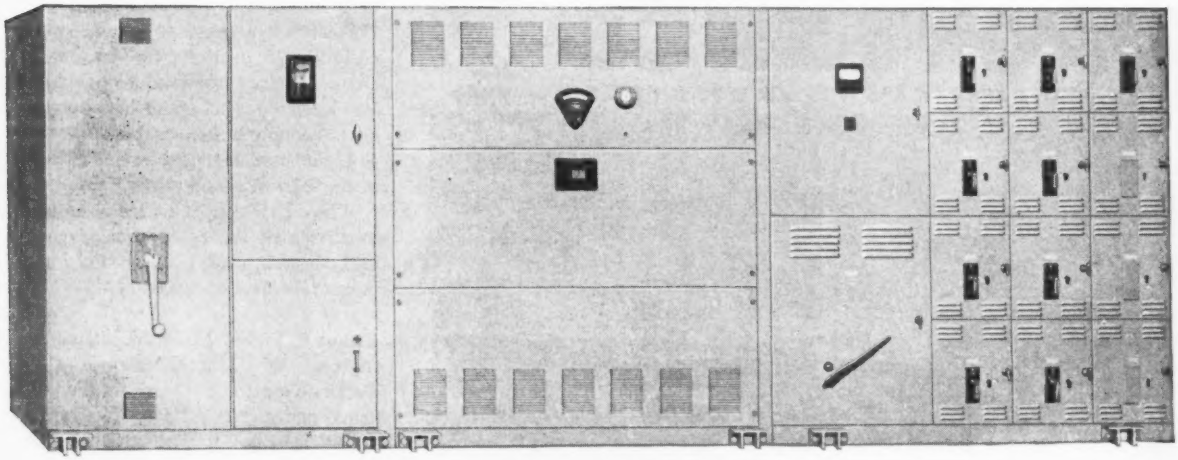
Reduces Costly Power Interruption. By locating the Substation at or near the load center, it restricts the power interruption to that area. Other areas, not affected, can continue operation.

Years of Continuous Hard Service. The rugged construction, liberal design, expert craftsmanship, sound engineering, all embodied in SORGEL Dry-type transformers, have given years of continuous hard service.

Engineered to meet your exact requirements

Not necessary to design or change your installation to fit a "standard"

Sizes up to 3000 Kv-a. All voltages up to 15 KV.



2000 Kv-a., 3-phase, 13,200 volt unit Sub-Station
With forced draft fans, automatically controlled by temperature indicator to increase transformer capacity 33⅓%; primary fused load break switch and kilowatt-hour meter, secondary voltmeter and drawout circuit breakers.

Also a Complete Line of Conventional Air-Cooled Dry-Type Transformers

¼ to 3000 Kv-a. Single phase and poly-phase. 120—240—480—600 volts.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled Dry-Type Transformers — Over 35 years

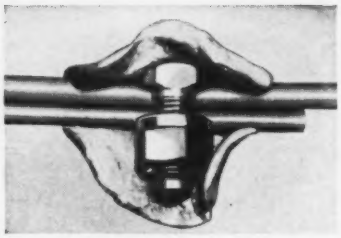
KEARNEY AIRSEAL

the MODERN WAY TO SEAL ELECTRICAL CONNECTIONS

AIRSEAL applied over a connector

Kearney AIRSEAL is a pliable high-dielectric compound for use on all electrical connections. It seals out corrosion and oxidation and maintains electrical efficiency and eliminates over-heating at joints.

AIRSEAL is easier to apply and much more effective than electrician's tape. Because it is chemically inert, it will not harden or deteriorate — forms a permanent seal.



Secure sealing of connectors is accomplished readily because of the pliability of *AIRSEAL*. Application is made by kneading the compound over the connector.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

PAGE FENCE — *Since 1883*

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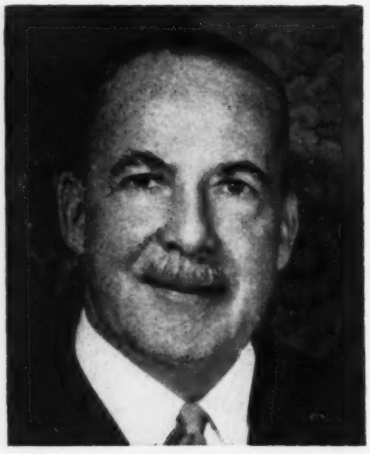
When you think of **hazards** think of PAGE, the pioneer name in fence protection for persons and property. Security is a job for Page Chain Link Fence, available in heavily galvanized Copper-Bearing Steel, rust-immune Stainless Steel or corrosion-resisting Aluminum. But this pioneer name means more than a quality product. It is a complete fence service, performed by more than 100 firms having technical training and fence erection know-how, and conveniently located throughout the country. For Page Fence data and name of firm nearest you—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, New York or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

OBITUARY



Clarence L. Law

Clarence L. Law, 67, retired vice president of Consolidated Edison Co of New York, Inc, died Dec. 24.

Law had been identified with customer and public relations throughout the 43 years he worked for the utility system. Starting as a special inspector in 1906 with New York Edison Co, Law advanced to become executive assistant to the president. When Con Edison's public relations activities were co-ordinated in 1939, he was put in charge as vice president. Probably the best known project under his direction at that time was the spectacular "City of Light" exhibit staged by Con Edison at the New York World's Fair.

When Law retired in 1950, he was in charge of the company's advertising, editorial, economic research, and industrial relations departments.

Arthur R. Smith, 73, former managing engineer of General Electric Co's Turbine-Generator Division, died at Schenectady, N. Y., Jan. 1. During his 50-year career with GE, he had been responsible for many major advancements in design and efficiency of steam turbines for land and marine use. At the time of his retirement in 1947, he had been manager engineer for 17 years. Author of many technical publications, Smith was a fellow of the American Society of Mechanical Engineers and a member of the Society of Naval Architects and Marine Engineers.

Henry L. Crain, 46, power plant engineer for Kansas City Power & Light

Co, died Dec. 21 while vacationing at Jackson, Miss. Crain, a graduate of the University of Illinois, joined the utility in 1928. He was appointed superintendent of Kansas City P&L's new Hawthorn Station shortly after construction was started in 1949.

Warren D. Hardaway, 56, superintendent of the hydroelectric production and transmission department for Public Service Co of Colorado, died recently at Denver. He joined the company in 1919.

Arthur B. Tuttle, 57, who retired in 1949 as treasurer of Radio Corp of America after 28 years with the firm, died at New York Dec. 16. He had been vice president and treasurer of RCA Communications, Inc, before he was elected treasurer of the parent company in 1946.

A. M. McCabe, 59, manager of the substation and valuation section of the operating and engineering department of Carolina Power & Light Co, died at Raleigh, N. C., Dec. 15. McCabe, a graduate of Virginia Polytechnic Institute, had taught physics at VIP and the Miller School in Virginia and had served in the test department of General Electric Co before joining Carolina P&L in 1917.

Robert E. Withers, 87, former treasurer and vice president in charge of finance for Aluminum Co of America, died Dec. 29 at Wytheville, Va. Withers, who joined Alcoa in 1895, was named treasurer in 1898, a post he held for 45 years. Alcoa appointed him vice president in 1922, a director in 1927, and senior vice president in 1931.

Raymond W. Vonasch, 40, manager of federal and marine sales for Ward Leonard Electric Co, Mount Vernon, N. Y., died Dec. 2. Vonasch, associated with Ward Leonard since 1936, had managed the firm's Newark (N. J.) office from 1946 to 1949 before accepting the manager's post at the home office.

Waverly D. Packard, 69, who retired from Western Massachusetts Electric Co last June after 46 years' service, died recently. At the time of his retirement he was superintendent of production for the Springfield area, a post he had filled since 1948.

Take a good look at this New Powerhouse!

The ONAN "CW" Electric Plant

5,000 or 10,000 WATTS

Designed to fit every application better . . . standby, portable, mobile and stationary. *Whatever* your need for electric power, the new Onan CW-5 and 10 give you top performance and value!

Here for the first time are 5 and 10KW electric plants powered by revolutionary, new air-cooled gasoline engines, *designed and built by Onan exclusively for electric plant use!*

Both engines are 1800 R.P.M. The 13HP Onan engine which powers the CW-5 and the 20HP Onan engine used for the CW-10 weigh much less than general-purpose engines, and are amazingly compact. Built to deliver dependable, trouble-free service in heavy-duty use. Two-cylinder, alternate-firing design assures smooth, vibration-free power. New, quiet, highly-efficient vacuum air cooling drives out all heated air through *one* side duct. The same duct carries exhaust gases, simplifying installation.

Impulse-coupled, high-tension magneto ignition for quick starting under all conditions. Both models in all standard voltages 60-cycle A.C., single or three phase.

Far Out Front in design and engineering

● Twin-cylinder, horizontally-opposed, air-cooled, alternate-firing engines ● Aluminum-alloy cylinder heads ● Extra-large, replaceable bearings ● Full-pressure lubrication, 6-quart oil capacity, oil filter ● Impulse-coupled, high-tension magneto ignition, radio suppressed ● Quiet, vacuum air-cooling of generator and engine ● Excellent accessibility; snap-off air housings ● High-performance generators ● Completely equipped with controls and instruments.

Write for folder and specifications

Onan ELECTRIC PLANTS

D. W. ONAN & SONS INC.

5434 UNIVERSITY AVE. S.E., MINNEAPOLIS 14, MINNESOTA

Bright '53 Seen . . .

. . . by NEMA for the electrical manufacturing industry. Heavy equipment shipments set pace

Total production for 1953 in the electrical manufacturing industry should at least match the $12 billion of the 1951 and 1952 all-time production peaks and may actually reach a new level between 5% and 10% higher in 1953, according to the National Electrical Manufacturers Association.

This statement was contained in a year-end report by W. J. Donald, managing director, and A. J. Nesti, chief statistician.

The report said generation, transmission, and distribution equipment has been the pace setter of the industry. Shipments have increased sharply each year with 1952 volume being more than twice the volume in 1947. This reflects the heavy and continuous expansions in 1952 in new power capacity installed, in power generated, which reached an all-time high of 463 billion kwhr; and power actually consumed, which also reached a new peak.

With new additions to power generating capacity, actual power generation, and actual consumption of electrical energy all expected to go still higher in 1953, the report said, there is little doubt of increased shipments in generating, transmission, and distribution equipment.

Insulated wire and cable sales in 1952 were slightly higher than in 1951 and a further slight increase is expected in 1953.

Sales of industrial apparatus, such as motors, controls, rectifiers, welding equipment, mining and industrial locomotives, after successive increases in 1950, 1951, and 1952, are expected to decline about 5% in 1953 due to an anticipated drop in new industrial building.

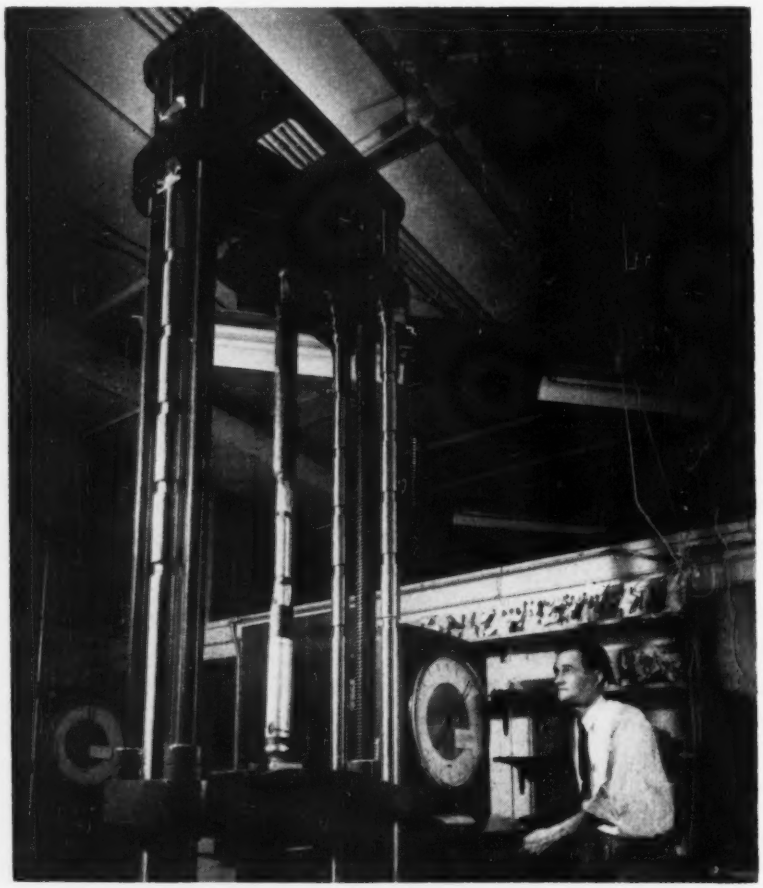
Electrical appliances, which dropped from a total manufacturers' dollar value of shipments of $4 billion in 1950 to $3.3 billion in 1951 and to $3 billion in 1952, are expected to reverse this downward trend and go to $3.5 billion in 1953.

Illuminating equipment, after a sharp 15% drop in business from 1951 to 1952 is expected to recover slightly with a 5% to 10% increase in 1953. Shipments of electrical equipment and supplies for building construction may show a slight drop in 1953, continuing a trend set in 1952.

MANUFACTURING BRIEFS

Aluminum Co of America has rejected Defense Mobilizer Fowler's proposal that major producers make a firm five-year contract to deliver aluminum to the government's stockpile. For this the aluminum producers were to be granted price increases of one-half cent a pound on primary aluminum pig and ingots and 4% on fabricated aluminum products. Terming the proposal inadequate, Alcoa renewed a request for boosts of 1% and 5% respectively.

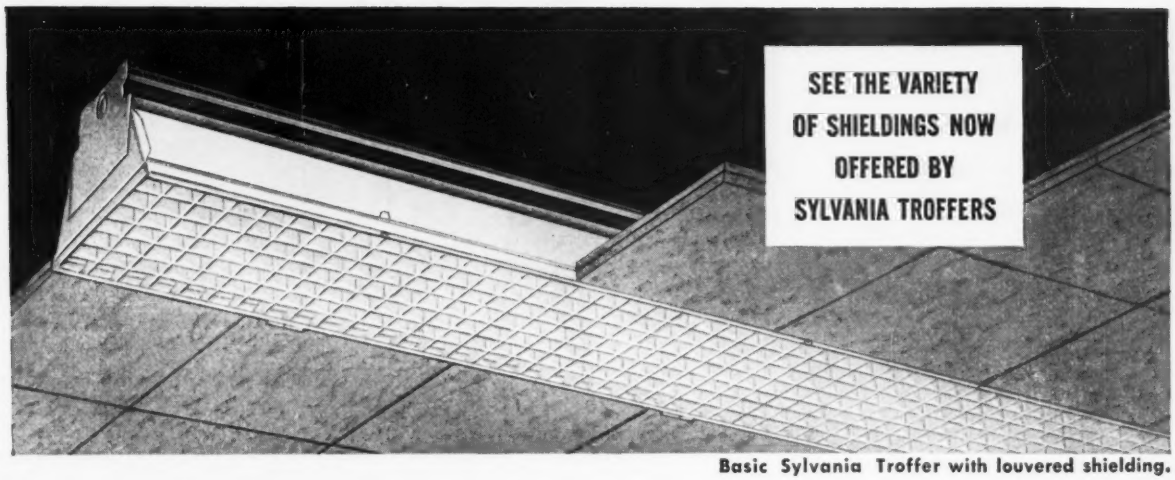
Domestic price of zinc was boosted last week by a half cent a pound to 13¢, East St. Louis. This price change was the first for zinc since last October when it was cut by a cent a pound from 13½¢ to 12½¢.



Splice Withstands 11-Ton Pull

More than 11 tons of pull was applied recently to this special aluminum cable splice in tensile testing machine used in Thomas & Betts Co's plant at Elizabeth, N. J. Specially engineered for 4-segment, compact segmental 2,250 MCM aluminum cable by Thomas & Betts and Detroit Edison Co engineers, it is being considered for use with 138-kv underground pipeline cable.

The compression joint made with a Thomas & Betts connector gives the splice lower resistance than an equal length of cable, even though the splice diameter is only slightly greater than that of the cable. The splice withstood a pull of 22,600 lb, more than twice the requirement.



Basic Sylvania Troffer with louvered shielding.

NEW FLEXIBILITY AND LIGHTING EFFICIENCY WITH *NEW SYLVANIA TROFFERS!*

Sylvania's new line of recessed troffers has been designed around a basic unit to provide the last word in *flexibility*.

These troffers may be installed separately or in continuous rows . . . to meet practically any intensity requirements, length or row, ceiling construction, or architectural style.

Sylvania troffers are finished in hard-baked Miracoat enamel on Bonderite treated steel. Available with either standard or instant start ballasts.

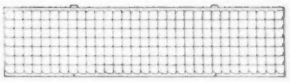
New Troffer Spot Lights, too

New Sylvania spots and corner boxes are also available to accent ceiling lighting patterns. These spots, readily placed at strategic locations, harmonize perfectly with adjacent troffer shieldings.

Fully guaranteed

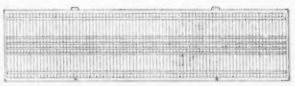
All Sylvania troffers are covered by the *broadest guarantee in the industry*. This includes lamps (when Sylvania lamps are initially installed), ballasts, starters, and wiring for a period of an entire year. For detailed information about this new troffer line, be sure to mail the coupon NOW!

45° x 45° Louvers . . . for classrooms, offices, and many types of stores. This shielding available with open or closed ends.



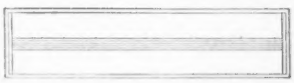
Albalite . . . provides attractive diffused lighting for scores of applications. Comes in both open- and closed-end frames.

Twinlite . . . another interesting diffused lighting shielding, available with open or closed ends. Ideal for reception rooms, hotel lobbies, and display areas.



Curved Lens . . . available with closed frames only. Provides an extremely attractive light source where less contrast is desired.

Plastic . . . comes with closed frames only. Sturdy, extra lightweight shielding for soft, diffused recessed troffer lighting.



QUALIFIED LIGHTING CONTRACTOR AUTHORIZED SYLVANIA SALES SERVICE

Urge your Electrical Contractor friends to display this emblem that directs prospects to their doors.

FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

SYLVANIA

Sylvania Electric Products Inc.,
Dept. 3L-2701, 1740 Broadway,
New York 19, N. Y.

Please send me illustrated folder describing the new line of Sylvania Recessed Troffers.

*Name*_____

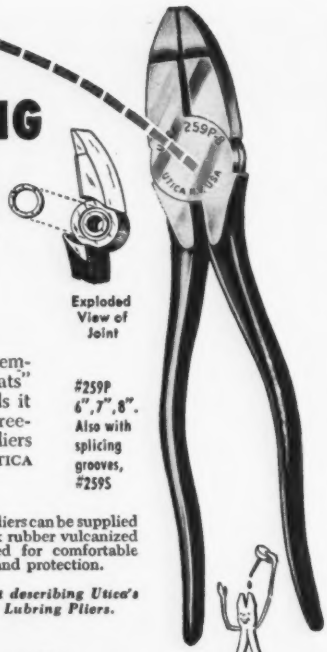
*Street*_____

*City*_____ *Zone*___ *State*_____

THIS LITTLE RING

MEANS SMOOTHER OPERATION

LONGER WEAR



Exploded View of Joint

UTICA *Lubring*®-the pliers that oil themselves! Porous iron lubricating ring "floats" in the joint, absorbs lubricant and feeds it as required. Keeps joint smooth and free-working. There are no finer lineman's pliers than these patented and exclusive UTICA heavy duty *Lubrings*.

#259P 6",7",8". Also with splicing grooves, #259S

SPECIAL HANDLES

Utica lineman's pliers can be supplied with heavy, black rubber vulcanized handles. Designed for comfortable grip, long wear and protection.

Send for booklet describing Utica's complete line of Lubring Pliers.

U TI CA

It pays to use quality tools — *and the world's best tools are made in U.S.A.*

DROP FORGE AND TOOL CORPORATION

UTICA 4, N. Y.

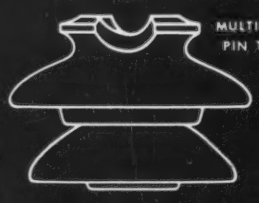
In Canada: ADLAM TOOL & SUPPLY CO., LTD., Montreal
WALLS IRONS, LTD., Winnipeg

APPROVED FOR R.E.A. USE

SUSPENSION TYPE

SPOOL TYPE

PIN TYPE



MULTIPART PIN TYPE

GUY STRAIN

REINFORCED WIREHOLDER

Write for NEW Free Insulator Catalog

ILLINOIS ELECTRIC PORCELAIN CO.

MACOMB, ILLINOIS

MEETINGS CALENDAR

Edison Electric Institute
Accident Prevention Committee, Hotel Muehlebach, Kansas City, Mo., Jan. 12-13; Prime Movers Committee, Mayflower Hotel, Akron, Ohio, Feb. 2-3; Transmission - Distribution Committee, Shoreham Hotel, Washington, D. C., Feb. 12-13; Electrical Equipment Committee, Jefferson Hotel, St. Louis, Mo., Feb. 16-17; 19th Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 30-April 2.

Institute of Radio Engineers
Joint High Frequency Measurements Conference with AIEE, Statler Hotel, Washington, D. C., Jan. 14-16; National Convention - Exhibit, Waldorf - Astoria Hotel and Grand Central Palace, New York, March 23-26.

Canadian Electrical Association
Eastern Zone: Engineering Division, Nova Scotian Hotel, Halifax, N. S., Jan. 15-16; Sales Division, General Brock Hotel, Niagara Falls, Ont., Jan. 22-23; General Division, Mont Tremblant Lodge, Mont Tremblant, Que., Jan. 29-30; Following Western Zone Division Meetings will be held at Palliser Hotel, Calgary, Alta.: Engineering, Feb. 23-25; General Division, Feb. 25-26; Sales Division, Feb. 26-27.

American Institute of Electrical Engineers
Winter General Meeting, Hotel Statler, New York, Jan. 19-23.

National Rural Electric Cooperative Association
11th Annual Meeting, Civic Auditorium, San Francisco, Jan. 26-29.

Public Utilities Advertising Association
Region 8 Meeting, Mayo Hotel, Tulsa, Okla., Feb. 2-3.

National Association of Corrosion Engineers
Short Course in Corrosion in cooperation with University of California, Berkeley, Feb. 2-6.

Missouri Valley Electric Association
Industrial-Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 5-6.

Pennsylvania Electric Association
Joint Meeting of Electrical Equipment-Relay Committees, Roosevelt Hotel, Pittsburgh, Feb. 5-6; Transmission—Distribution Committee, William Penn Hotel, Pittsburgh, Feb. 12-13; Systems Operation Committee, Hotel Brunswick, Lancaster, Pa., Feb. 19-20.

Maryland Utilities Association
Annual Meeting, Lord Baltimore Hotel, Baltimore, Feb. 17.

National Adequate Wiring Conference
La Salle Hotel, Chicago, Feb. 26-27.

Southern Safety Conference-Exposition
Hotel Atlanta Biltmore, Atlanta, Ga., March 1-3.

North Central Electric Association
Electrical Industries Meet, Hotel Nicollett, Minneapolis, March 8-11.

North Central Electrical Industries
1953 Electrical Industry Convention, Hotel Nicollett, Minneapolis, March 8-11.

National Electrical Manufacturers Association
Winter Meeting, Edgewater Beach Hotel, Chicago, March 9-12.

Illuminating Engineering Society
Canadian Regional Conference, Chateau Laurier, Ottawa, Ont., March 23-24.

A&M College of Texas
Conference for Protective Relay Engineers, Dept. of Electrical Engineering, College Station, Tex., March 23-25.

***Southeastern Electric Exchange**
20th Annual Conference, Boca Raton Hotel, Boca Raton, Fla., March 23-25; Engineering-Operation Section, Edgewater Gulf Hotel, Edgewater Park, Miss., April 16-17; Industrial Power Sales Conference, Fort Sumter Hotel, Charleston, S. C., May 21-22.

*** Addition this week.**

"she might have been my kid..."

"There was no time to stop, see? She comes running out from behind this parked car right under my wheels. Her hair is in pigtails, and with the sun shining on it, she might have been *my* kid. We got her to the hospital. It took 3 pints of blood to bring her around. All I have to do is remember the sound of those screaming tires—and I know why *I'm* giving blood."

Yes, all kinds of people give blood—truck drivers, office workers, salesmen. And—for all kinds of reasons. But whatever *your* reason, this you can be sure of: Whether your blood goes to a local hospital, a combat area or for Civil Defense needs—this priceless, painless gift will some day save an American life!

Business Executives! ✓Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed your employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

Give Blood Now

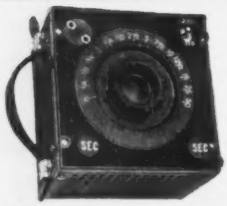
CALL YOUR RED CROSS TODAY!

NATIONAL BLOOD PROGRAM

A Wide Variety of

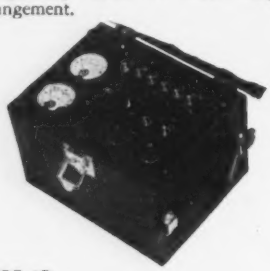
THE STATES COMPANY

PORTABLE PHANTOM LOADS for Easier, Quicker METER TESTING



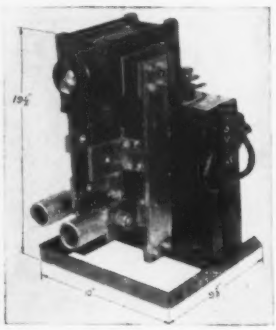
TYPE FD

Capacity 50 amperes, 120 and 240 volts. Designed for prolonged duty cycles. Equipped with series parallel switch on the primary circuit for more compact arrangement.



TYPE ID

Primary range 100-125/200-250 volts, 60 cycle. Recommended for use on circuits where wide variations of voltage or burden are encountered.



TYPE M

Capacity 800 amperes at 1, 2, 3, and 4 volts. Also, an M Load, capacity 300 amperes, 120 and 240 volts. For heavy circuit output. Provides source of heavy current with a minimum of weight.

Write for Full Particulars

THE STATES COMPANY
3 New Park Ave., Hartford, Conn.
Please send Cat. No. 1, Sec. 1F
Name..... Title.....
Firm.....
City..... Zone.....State.....

CATALOGS • BULLETINS

● **PRECISION METAL PARTS:** Some of the many parts described and illustrated in this new catalog are special pins and pivots; screw driver blades; all types of rotary swaged rods, wires and tubing in practically all kinds of metals; mandrels for grinding wheels, abrasive points and polishing wheels; perforating punches in straight carbon or alloy steels. For copies write to Torrington Company, Specialties Division, 500 Field Street, Torrington, Connecticut.

● **COMPENSATOR CALCULATOR:** A new slide rule for determining line-drop compensator settings has been developed by General Electric Company, Schenectady 5, N. Y. Two movements of the slide and some data about your system are all that is needed to obtain correct settings for 36 inch equivalent conductor spacing. Multiplication factors, on the back of the calculator, are used to correct reactance settings for other spacings.

● **PROCEEDINGS:** A new catalog of 168 pgs including charts, forms and illustrations is now available of the Proceedings of the 16th Annual Time and Motion Study and Management Clinic sponsored by the Industrial Management Society. This catalog contains complete transcripts of talks by top leaders of labor, management, and government. Copies may be obtained for $4.00 per copy by writing to Industrial Management Society, 35 East Wacker Drive, Chicago 1, Illinois.

● **FLEXIBLE CORDS:** An illustrated 24 pg. bulletin which includes all of the new Underwriters' classifications for flexible cords manufactured by Whitney Blake Company, New Haven 14, Conn., is now available. It features data on Dynaprene and rubber jacketed cords as well as braid covered types. Write the company for information.

● **INSTRUMENT DATA SHEET:** A new quick reference data sheet covering a complete line of electrical measuring instruments has recently been announced. This sheet lists models for insulation resistance, ground resistance, and high voltage testing plus other special purpose instruments. Available free upon request. Write to Associated Research, Inc, 3760 W Belmont Avenue, Chicago 18, Illinois, for Bulletin 10AA.

● **HERMETIC SEALS AND ASSEMBLIES:** New Sealtron 32 page catalog-brochure features photos, diagrams and data concerning over 1600 stock seals and special assemblies. Also shows company's line of electronic and electrical control systems, test equipment, components, communication equipment. Furnishes complete descriptions and specifications of product lines, pertinent facts about company history, engineering and production achievements, quality control. Copies may be obtained by writing Sealtron Company, 9701 Reading Road, Cincinnati 15, Ohio.

● **CARBON PRODUCTS:** A new brochure No 6-D has been released by Superior Carbon Products Inc, 9115 George Ave, Cleveland 5, Ohio. The 25 page booklet contains information on brushes, cable locations and carbon plates.

● **WELDERS:** A newly revised 4 page two color illustrated bulletin describing the Colmonoy Spraywelder and Sprayweld Process is now available from Wall-Colmonoy Corporation, 19345 John R Street, Detroit 3, Michigan. The bulletin describes and illustrates latest developments in Spraywelding equipment and techniques that enable powdered Colmonoy hard facing alloys to be fusion-bonded to metal parts by a three-step process to provide non-porous, wear, heat, erosion and corrosion-resistant surfaces. Copies are available.

● **ELECTRODE RAPPING:** A new 6 pg bulletin with illustrated information on the recently developed M.I. (magnetic impulse) continuous electrode rapping system for electrostatic precipitators, has been announced by Research Corporation, Bound Brook, N. J., manufacturer of Cottrell Electrostatic Precipitators. A copy may be obtained by writing the company.

● **GEAR MOTORS:** Gleason-Avery, Inc, 45 Aurelius Ave, Auburn, New York, manufacturer of instrument, timing and gear motors, announces that a new catalog of products and services is now available. The catalog includes specifications and illustrations of synchronous and non-synchronous instrument motors, series "500" gear reduction motors and temperature controls, complete with rating charts and mounting dimensions. Also included to aid manufacturers are a list of possible applications of motors and a complete index of sales representatives throughout the country. The new catalog may be had by writing the above company.

● **SPINNING ZINC:** A pictorial explanation on the center page spread tells the story of the specialized art of spinning zinc. Although zinc oxide has been made in this country for about 100 years, it has been modified by different treatments and forms to make it particularly useful for industries which it serves. Copies are available from the New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

● **LINT-FREE TEXTILE MOTOR:** A revised leaflet on the construction and application of the lint-free textile motor is available from the Westinghouse Electric Corporation. It describes the motor's use as an individual drive for pickers, roving frames, winders, and spinning and twisting frames, and shows how special design of end brackets and air passages prevent clogging by lint or other dirt. For a copy of this leaflet, B-3515-A, write the company, Box 2099, Pittsburgh 30, Pennsylvania.

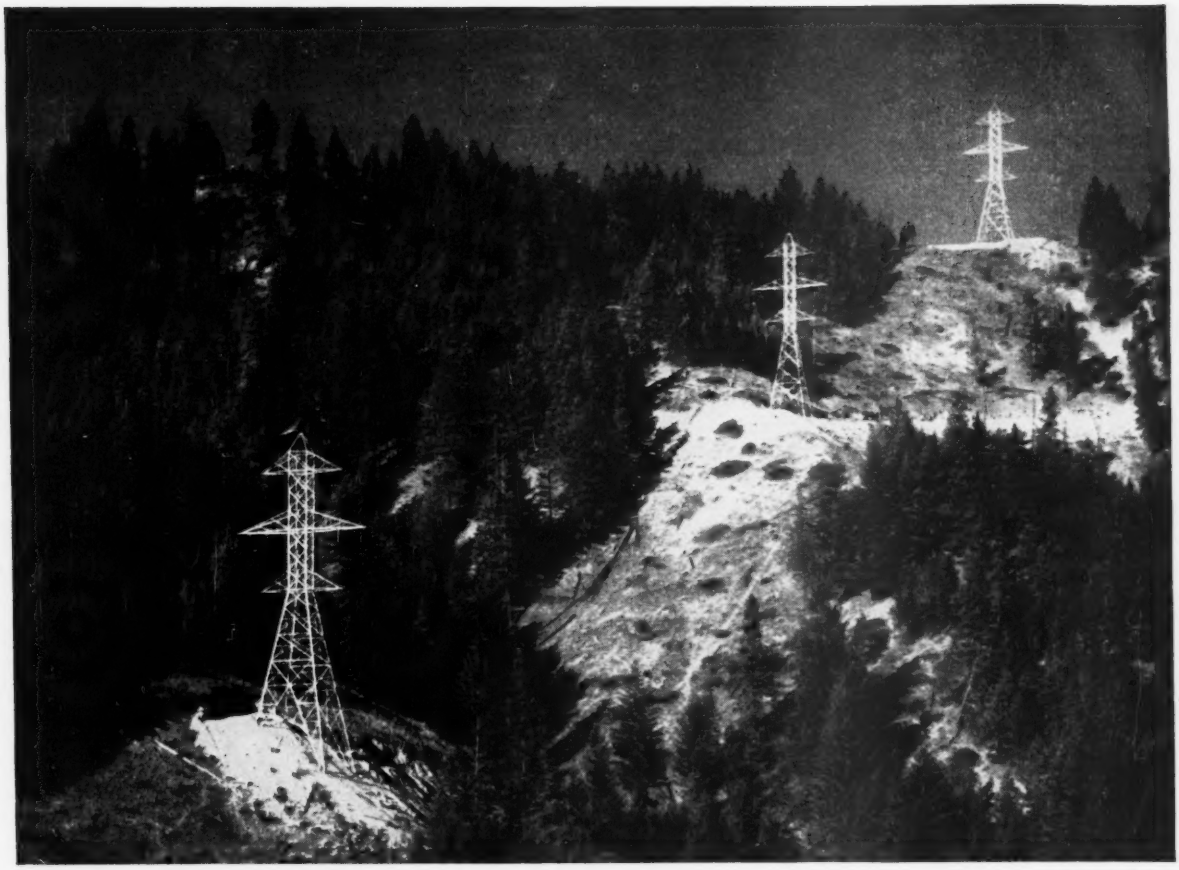
● **TEMPIL® PELLETS:** A bulletin entitled "Instructions for Using Tempil® Pellets" dicusses helpful suggestions for the use of Tempil® Pellets in a variety of applications. Copies of this bulletin will gladly be supplied upon request by writing Tempil® Corporation, 11 West 25th Street, New York 10, N. Y.

● **POWER FUSES:** The Southern States Equipment Corporation, Hampton, Georgia has published a new Bulletin No 52B covering their line of outdoor dropout expulsion power fuses. Copies are available by writing to the above company.

● **NEW MICROWAVE EQUIPMENT:** A new catalog describing the 2000-mc microwave system that utilizes microwave radio (Type FR) and frequency-division multiplex equipment (Type FJ) is now available from Westinghouse Electric Corporation, P. O. Box 2099, Pittsburgh 30, Pennsylvania.

● **DESIGN AND COST FACTORS:** Basic design principles and new information on mechanical properties are combined with an analysis of cost and production factors in The New Jersey Zinc Company's 32 pg manual, "Facts About Pressed Brass and Other Nonferrous Powder Parts," just off the press. Written primarily for designers, engineers, and metallurgists, the new handbook is intended to be a concise reference to the factors which should be considered in designing and selecting small structural parts for fabrication by the powder metallurgy method. Emphasis is on parts made from brass, although examples of nickel silver and bronze applications are reviewed. Copies of the manual may be obtained without cost by sending requests, on a company letterhead, to the company, Front and Fletcher Streets, New York 38, N. Y.

● **RUST PREVENTION:** A new catalog explains how to save the cost of chipping rust away by painting metal with S.R.P. (Sure Rust Prevention), a rust inhibiting paint, which outlasts red lead. For literature, including technical data, and color card, write Dept P-5, L Sonneborn Sons, Inc, 80 8th Avenue, New York 11, N. Y.



127-mi 230-kv Power Line in Puget Sound Area

This is part of the Bonneville Power Administration's new Foster Creek-Snohomish line, carrying hydroelectric power to several communities in the northern Puget Sound area. The 230-kv line is 127 mi long, and consists of 411 single-circuit and double-circuit galvanized towers. The towers are about 125 ft high, and weigh approximately 17 tons each. They were fabricated by Bethlehem Pacific.

Bethlehem has complete facilities for handling your transmission tower work. For one thing, we've had more than half a century of experience in designing and fabricating towers. And we have three tower-fabricating shops—at South San Francisco, Calif.; Seattle, Wash.; and Leetsdale, Pa., near Pittsburgh. These shops are equipped to accurately shear, punch, form and galvanize. They are staffed by men who know the tower business from beginning to end.

Why not talk over your tower needs with a Bethlehem representative? He'll be pleased to study your problem and offer recommendations. All you need do is drop a line to the nearest Bethlehem office.

BETHLEHEM STEEL

Bethlehem Steel Company, Bethlehem, Pa.

On the Pacific Coast the fabrication of transmission towers is handled by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

Transmission Towers

PREMAX

Identification

for Poles and Other Equipment

Select markings that will be plainly legible under adverse weather conditions as well as on clear days—that are easy to install—and that require no maintenance costs.

There is one answer that meets ALL requirements: Premax Stamped and Embossed Metal Letters, Figures and Special Tags. Cost less to install than stenciling — and outlast the average pole.

Send for samples and prices today.

PREMAX PRODUCTS
DIVISION CHISHOLM-RYDER CO., INC.
5347 Highland Ave. Niagara Fall, N. Y.

In WIRE ROPES, too a *Specialist* can do it better

WICKWIRE ROPE

● The extra durability and dependable performance you get from Wickwire Rope is a natural result of over 125 years of specialization in the manufacture of wire and wire products. From molten metal to finished rope, every phase in the manufacture of Wickwire Rope is handled in our own plants, under constant and careful control.

Thus we make sure that you get the right wire rope for your particular conditions—rope that will give you the longest and most satisfactory service. *For your free copy of "Know Your Ropes" write to:* Wire Rope Sales Office, Wickwire Spencer Steel Division of C.F.&I., Palmer, Mass.

The Colorado Fuel & Iron Corporation, Denver, Colorado
The California Wire Cloth Corporation, Oakland, California
Wickwire Spencer Steel Division, Palmer, Massachusetts

WICKWIRE ROPE
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION CF&I

BRANCHES IN ALL KEY CITIES

Load Forecasting

(*Continued from page* 65)

vailing in the December month when the maximum undiversified load of the utility systems in the nation occurs must be forecast. Of the month-annual relationships requiring consideration, two are immediately apparent. First is the relation of the December FRB Index to the average annual FRB Index; second is relationship of kwhr to the FRB Index.

Further consideration indicates that one more relationship must be brought into the picture, and this is some index of the pressures for second and third shift operation of industrial plants. While the relationship is empirical, we have found the pressures for second and third shift operation to be quite reliably reflected by the hours in the manufacturing work week. Experience has indicated that the basic load factor of this class varies in direct proportion to hours in the manufacturing work week. In our method we determine from load characteristic data the basic annual load factor for a normal week and then adjust this for other assumptions as to the length of work week.

The relation between the morning and evening peak contributions of this class while fundamentally related to the December load factor can be expressed in relation to hours in the December manufacturing work week.

Other Miscellaneous Classes . . . There are a number of miscellaneous classifications which include railroads and railways, street and traffic lighting, other public authorities, interdepartmental, and company use.

In the nation as a whole these classes are of relatively minor individual significance and tend to be quite stable in their trends. Sufficient accuracy is usually achieved by simple projection of the trend of kwhr sales. Load factors and morning and evening peak relationships for railroads and railways and for street and traffic lighting require individual determination, but for the remaining three classes, factors developed for the small light and power class appear to give consistent results.

Summary of the Peak Forecast . . . After having developed the peak data

STRENGTH, ENDURANCE that Meet the Test!

Crapo GALVANIZED Guy and Messenger Strand

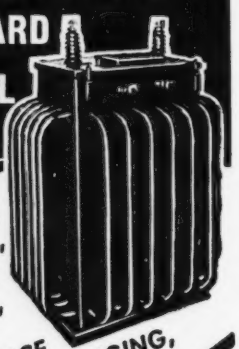
IN THE FIELD as in laboratory tests . . . *Crapo* Galvanized Steel Strand proves itself capable of withstanding severe punishment. Steel's inherent strength and durability are combined with definite economies in every size and grade of *Crapo* Steel Strand. You'll find the heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Contact your jobber of *Crapo* Galvanized Products or write direct for further information!

INDIANA
STEEL & WIRE COMPANY
MUNCIE, INDIANA

EISLER

TRANSFORMERS
STANDARD • SPECIAL
AIR • OIL • WATER-COOLED



POWER, LIGHTING, HEATING, WELDING, ELECTRIC FURNACE PHASE CHANGING, ETC.

EISLER Transformers are built strictly to N. E. M. A., A. S. A. and A. I. E. E. standards.

⅛ TO 500 KVA • UP TO 15,000 V.

SEND FOR NEW CATALOG NO. TR-50

CHAS. EISLER
EISLER ENGINEERING CO., Inc.
769 SOUTH 13th ST. NEWARK 3, N.J., U.S.A.

class by class and having adjusted these for losses to an "at-the-power plant" basis, the determination of the undiversified sum of the system peaks of all utilities contributing to the public supply involves only the addition of the respective morning and evening peak contributions, averaging the sums and multiplication by 1.05 to adjust for the diversity among the systems as between morning and evening peaks.

Individual Company Peak Load Forecasting . . . The method of forecasting the national peak load of utilities we have just considered was actually derived from a nearly identical method developed for forecasting kwhrs and peak loads of the Cleveland Electric Illuminating Co in its own service area. Instead of using the small light and power—large light and power classification, we prefer to use rate schedule classifications with the small commercial class as one group and the large commercial and industrial class either as separate groups or combined. Since our small commercial group as a class has distinct evening peak characteristics, we avoid some of the complications mentioned for the small light and power classification for the nation where there is a considerable mixture of load groups with evening peak and day peak characteristics.

For our overall large commercial and industrial class we find we get the best results by separating from the group all major electro-chemical loads and one large special load type, the Airplane Engine Research Laboratory of the NACA. If these loads should not follow the trends of national business levels, and very frequently they do not, substantial errors would be introduced into the forecast. As we treat individually a greater percentage of very high load factor loads than was done for the nation, our basic load factor for the residual is somewhat lower than that used in forecasting the nation.

In individual local areas, an independent check of the results as to peak contribution of the large commercial and industrial class is available by comparison with a development of the same from the composite of individual consumer expectations of load changes. In our own forecasts, we periodically make such a check and where we find differences of any substantial significance, both approaches are reviewed and modifications made until results check out.

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easy to install, economical for
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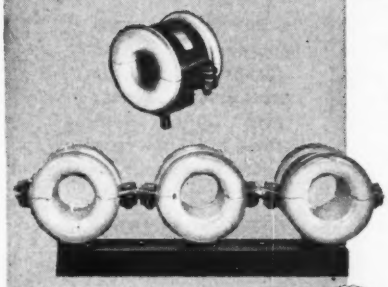

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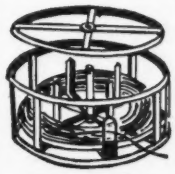

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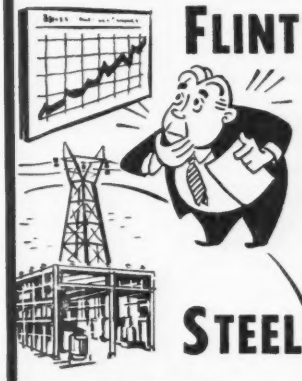

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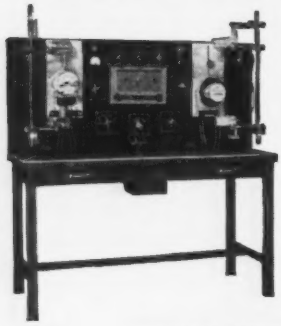

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71

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Microwave

(*Continued from page* 81)

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Two frequency control loops are incorporated in the 2,000-mc equipment. One compares the transmitted carrier frequency with a crystal oscillator. It stabilizes the entire repeater chain in one direction to the next terminal station. Such a device is incorporated in each terminal station transmitter. A second frequency control loop is incorporated in each receiver. This loop keeps the heterodyned signal matched to the passband frequency of the IF amplifier.

At terminal stations, where supervision of the microwave system is maintained, the terminal service unit is included. At unattended remote terminals, a repeater service unit may be provided to send out fault indications.

Faults are indicated by lights. The proper number of lights must show to indicate a fault. The particular combination of lights tells which station has trouble and the type of that trouble. These faults are indicated at four minute intervals. When a series of faults occurs, each one is indicated in turn.

Such a system not only protects the reliability of the communication system itself but protects that system against the danger of false indications of trouble.

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PROFESSIONAL SERVICES

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U. S. Government

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MICHAEL W. STRAUS, Commissioner

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3866) will be received at Denver, Colorado, until February 10, 1953, for furnishing one (1) 16,500/22,000-kva, 115,000/66,400- to 4,000-volt, 3-phase, Class OA/FA, outdoor power transformer, with current transformers and tank-mounted arresters for Little Porcupine Switchyard, Missouri Diversion Unit, Montana, Missouri River Basin Project. Delivery is desired within 750 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

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3	200	Pitts.	66000—2300
3	200	A. C.	45000—2400/7200
4	150	West.	44000/33000—2300/6900
6	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
6	25	G. E.	44000/22000—2200/480
4	5000	G. E.	40935/70900 Y—14500
3	5000	G. E.	38100/66000—6600
1	18750	A.B.B.	34840—11000, 3 ph.
2	5000	West.	33000—26400, 3 ph.
3	200	A. C.	34500—2400/7200/12470 Y
4	200	G. E.	34500—230/460
3	100	West.	33000—240/480 NEW
3	100	A. C.	33000—7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
6	2125	G. E.	26400/13200—2300
4	1500	A. C.	25400/44000 Y—6900/13800
4	450	A. C.	25410/44000—13280/23000
6	100	G. E.	22000—7200/12470 Y
9	50	G. E.	22000—2300
1	5000	Mol.	13800—460, 3 ph.
1	450	Penna.	13200—2400, 3 ph. ASKAREL
3	200	G. E.	13800—2300
1	3750	G. E.	11000—2300, 3 ph.
3	500m	Mol.	7200/12470 Y—2400/4160 Y
3	250	Pitts.	7200—220/440
3	100	G. E.	7200—240/480
3	150	Wag.	6900—2300
3	37½	G. E.	6900—230/460
2	100	G. E.	4800/2400—480/240
3	1500	A. C.	2300/4000 Y—2300
2	250	West.	2300—460
3	150	West.	2400—230/115
1	100	G. E.	2300—575, 3 ph.
6	50	West.	2400—114/228, DRY TYPE

INDUC. REGULATORS—OUTDOOR

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
4—60 KVA West. 250/500 A. 2400 V. 1 ph.
6—48 KVA G. E. 200 A. 2400 V. 1 ph.
8—36 KVA West. 150/300 A. 2400 V. 1 ph.
2—36 KVA G. E. 75/150 A. 4800 V. 1 ph.

CIRCUIT BREAKERS

1—400 A. 37 KV G. E. FHKO-236-500 MVA
1—1200 A. 15 KV G. E. FKO-139-350 MVA
4—600 A. 15 KV G. E. FHKO-139-750 MVA
1—600 A. 15 KV G. E. FHKO-136-250 MVA

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On this, the Occasion of a New Year, Our Entire Staff Extends the Most Cordial Greetings to all our Friends and Customers . . . . . and hopes that their year '53 will be a prosperous and fruitful one.

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ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

FROM AVAILABLE STOCK

TURBO GENERATORS IN STOCK

Qu.	KW	Make	Desc.
1—	1000	G.E.	Non-Cond—190 lbs—2400-3-60
1—	1000	Moore	Condensing—Extraction—190 lbs., 2400-3-60—Surface Cond.
1—	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1—	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter
1—	400	Westgh.	Non-Cond.—125/150 lbs., 5/10 lbs. B.P., 240/480-3-60
1—	300	G.E.	Non-Cond.—150/175 lbs., 5/10 lbs. B.P., 480-3-60

FREQUENCY CHANGERS

KVA	Make	RPM	Voltages	Frequency
1—3750	G.E.	300	2400/4150—2400/4150	25/60/25
1—3125	G.E	300	2400/4150—2400/4150	25/60/25
2—2500	G.E.	750	2400/4150—2400/4150	25/62½/60/24

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu.	KW	Make	Speed	DC Volts	AC Volts
1—	2000	G.E.	514	600	6600/13200
2—	2000	G.E.	500	666	25 cy. 11000
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
3—	1500	G.E.	514	250	6600/13200
3—	1500	G.E.	600	600	2300/4150
1—	1000	G.E.	900	260	4100/6900
2—	1000	Whse.	900	600	2300/4158
1—	500	Whse.	900	250	6609/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	150	G.E.	1200	275	2300
1—	100	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
3—1250	G.E.	HVDDJ		6600x550
1—1150	A.C.	OISC		13200x480/2400
3—1000	G.E.	HVDDJ	1	2200x480
9— 300	G.E.	HT	3	24000x240/480

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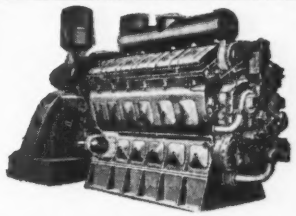
IMMEDIATE SHIPMENT
UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	K	Make	Model	HP	RPM
1500	Fairbanks Morse	33E16	2000	300	320	Buckey	80	480	600
1125	Fairbanks Morse	38D	1600	720	320	Enterprise	DSG-6	560	450
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	280	Fairbanks Morse	37-E	374	280
750	General Motors	12-567	1080	720	200	General Motors	6-268A	250	900
800	Baldwin	VO-8	750	514	100	Worthington	BS-6	150	600
800	General Motors	8-278A	750	720	100	General Motor	3-268A	150	1200
600	General Motors	8-567	720	720	80	General Motors	6-71	90	1200
400	Ingersoll-Rand	8-8	600	720	30	Internat'l Harvests	UD-14	45	1200
350	Baldwin	VO-6	510	450					

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TRANSFORMERS
1—1500 KVA G.E., 3 Ph., 4150V. 2300V Pyranol
2— 750 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
2— 400 KVA Pitts., 1 Ph., 2400/4800V. 240/480V.
3— 333 KVA Whse., 1 Ph., 2400V. 600 V sec.
2— 200 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
1— 200 KVA G.E., 3 Ph., 2400-220 Sec.
3— 100 KVA Whse. 1 Ph., 13,200V—220/440.

SYNCHRONOUS MOTORS
1— 300 H.P., Elec. Mach., 720 RPM, 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G. E., 1800 RPM, 220V, 3/60
2— 150 H.P., Al. Chal. 360 RPM, 440V. 3/60

MOTOR GENERATOR SETS
1—1000 KW Whse., 600 V 720 RPM, 4000 Syn.
1—1000 KW G.E., 600 V, 514 RPM, 4000V Syn.
1— 200 KW Whse., 275V, 900 R.P.M., 220 V Syn.
1— 176 KVA West., 1Ph., 220V, Motor 3Ph., 440V.
1— 150 KW G.E., 126/250V, 1200 RPM, 2300 Syn.
1— 100 KW G.E., 250V. 900 RPM, 2300V. Syn.

SLIP RING MOTORS
1— 400 H.P. West. CW, 450 RPM 550V.
1— 250 H.P., West., CW, 600 RPM, 440V.
1— 200 H.P., West., CW, 600 RPM, 440V.
3— 150 H.P., Al. Ch. 1800 RPM, 2300V., 3Ph. 60 Cy.
1— 100 H.P. G.E., MT 600 RPM 440V.

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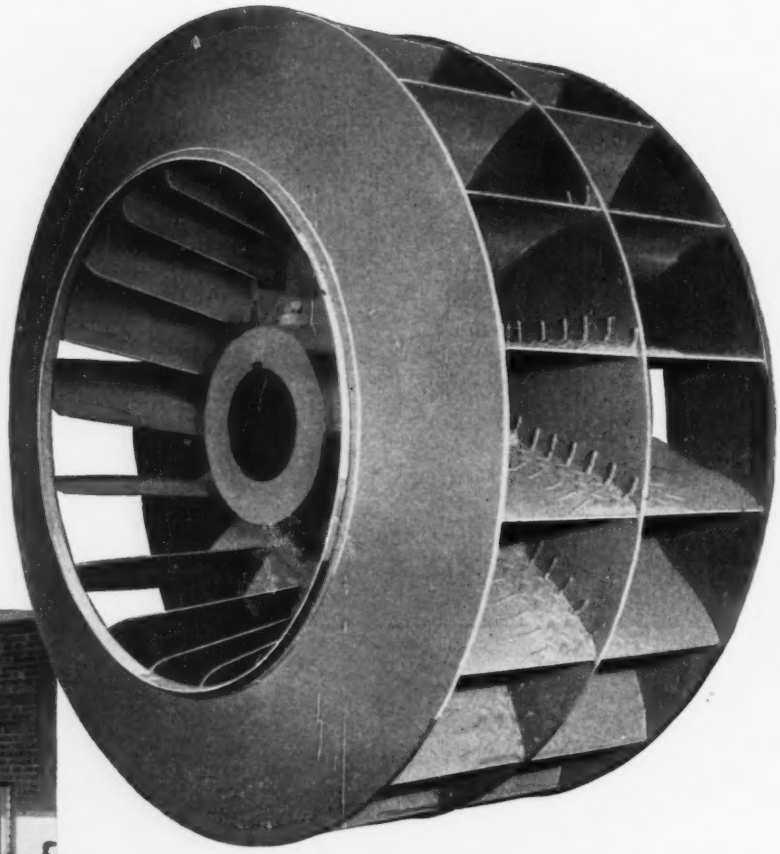
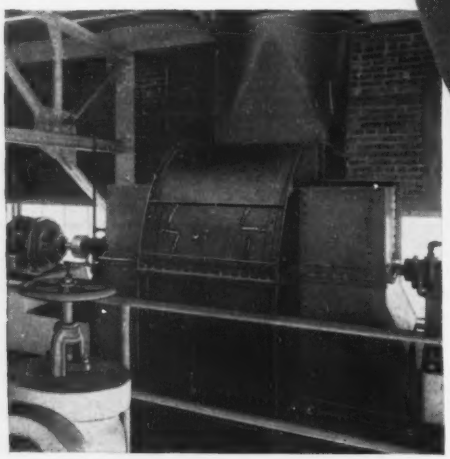
"Buffalo"

Tips on Getting Best Results With FANS

How a WHEEL Helps to Cut POWER COSTS





The rotor of the "Buffalo" Double Width Induced Draft Fan moves a lot of hot, erosive, fly-ash in its job of getting maximum Btu's from your fuel. Now, this treatment is destructive, as combustion engineers know, and down-time in the boiler room can be expensive. Thus, the rotor that can stand up is going to cut power production costs.

Note the heavy plate used in the blades, center plate and flanges in the all-welded rotor shown (also available in riveted construction). Welded-on wearing strips lengthen blade life, and these may be built up again easily, whenever necessary. *Here's a wheel built to keep turning!* And it's just part of the long-life "Buffalo" Draft Fan construction, which includes oversize shafts, highly serviceable bearings, rugged housings of bolted sectional design for accessibility. If you are looking for lower steam generation costs, look into "Buffalo" Draft Fans. Write for Bulletin 3750 today!

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A Glance tells you it's Overloaded

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WHEN THE BRILLIANT SIGNAL LIGHT of the *Thermalite* overload indicator flashes on, you can tell — at a glance — that your distribution transformer is overloaded. There is no interruption of service. Time-saving visual detection like this can save you hundreds of man-hours on costly surveys. It will help to eliminate transformer burnouts and service interruptions

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Simple in operation . . . the warning light is actuated by a thermal device in the top oil. The light snaps on during excessive overload periods and remains on until turned off by an external handle.

The *Thermalite* indicator will stretch the dollars you spend for transformer protection. It's low in original cost, dependable and requires no maintenance. It is engineered, calibrated and installed at the factory.

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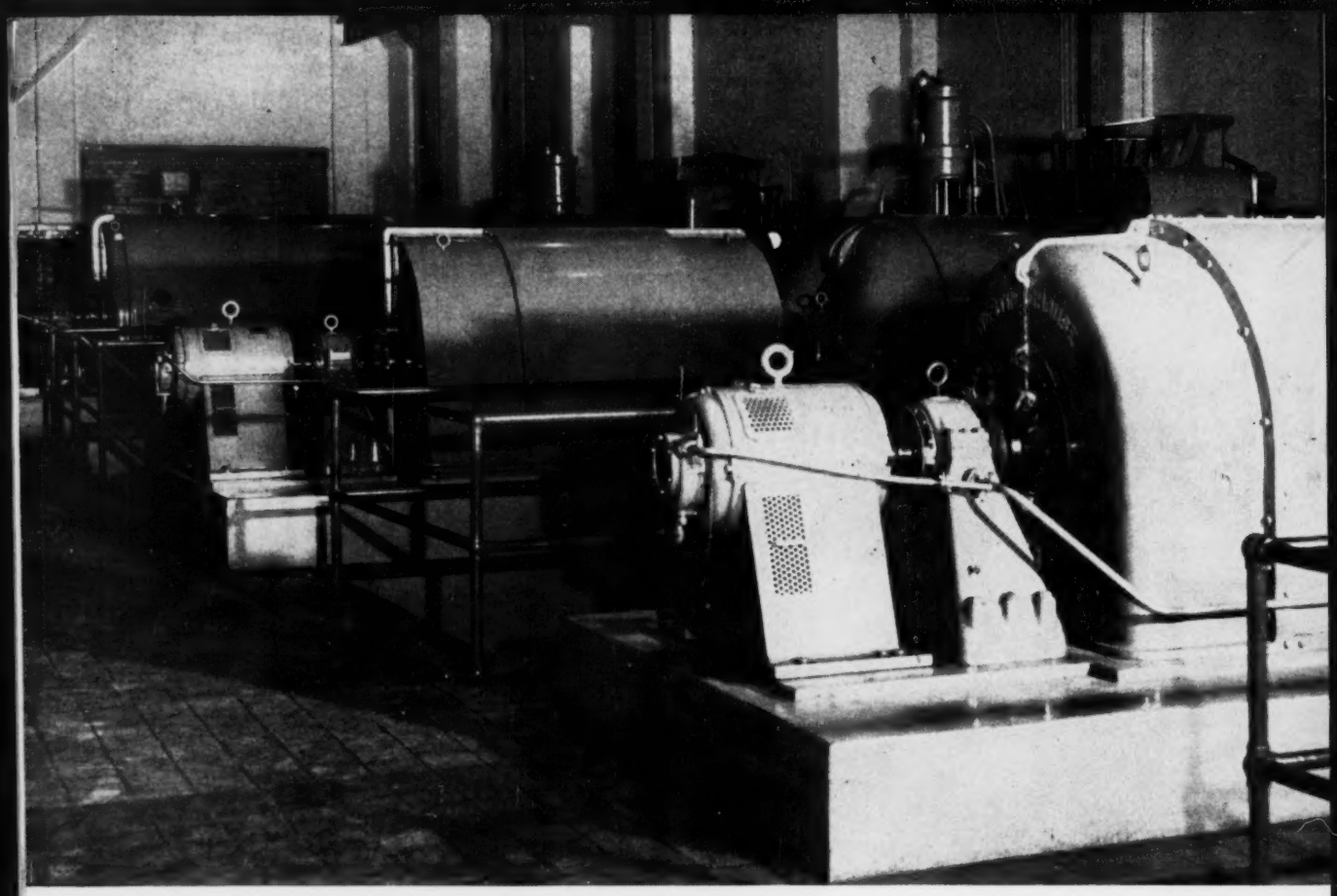
ALLIS-CHALMERS

The Thermalite overload indicator is available on distribution transformers 100 kva and smaller, 15 kv and below.



Turbine oil with a past . . . and future

• The story of NONPAREIL Turbine Oil in the Water and Light Commission plant, Fairmont, Minnesota, is one of a long successful past and a guaranteed trouble-free future. It's a typical story of the kind of performance offered by NONPAREIL Turbine Oil.

NONPAREIL
TRADE MARK
Turbine Oil

In 1929, NONPAREIL got its start in this plant by solving a sludge problem in a 1500-KW unit. Water could not be separated from the conventional lubricant previously used, and sludge had resulted. Good separation was obtained with NONPAREIL, and sludge troubles were eliminated.

As other units were installed, they were filled with NONPAREIL—a 2500-KW unit in 1938, a 4,000-KW unit in 1945, a 4,000-KW unit in 1949.

None of the original fills of oil has ever been removed from the four turbines, either for reconditioning of the oil or for cleaning of the lubrication systems. Neutralization numbers of the oil fills have remained below 0.09 mg. KOH/gm. There have been no failures or troubles of any kind caused by faulty lubrication.

That's the past of NONPAREIL Turbine Oil in this plant—23 years of trouble-free, cost-free lubrication. What's more, the same effective lubrication is assured for the life of these turbines. Each fill of NONPAREIL is guaranteed by Standard Oil to last for the life of the turbine it lubricates and to maintain a neutralization number below 0.15 mg. KOH/gm.

A Standard Oil lubrication specialist will be glad to show you lubrication records of NONPAREIL in installations similar to your own. In the Midwest, you can contact him by phoning your local Standard Oil office. Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

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